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Applying Acceptance-Based Therapies to Help
People Live Well after Cancer Treatment

Kate Randell

Doctorate in Clinical Psychology

The University of Edinburgh

2017

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Abstract to Thesis Portfolio

Background

With advances in medical treatments, the numbers of cancer survivors have grown considerably over recent years. Following completion of cancer treatment, patients can experience a range of physical and psychological difficulties, particularly around critical transition phases such as adjustment to survivorship. One of the most common difficulties cited by cancer survivors is that of fear of cancer recurrence (FOR). Existing treatments for improving psychological wellbeing in this population appear to offer limited efficacy, and there are very few interventions directly targeting FOR. Acceptance-based approaches, with an underlying aim of improving psychological flexibility, offer one novel alternative approach to addressing these difficulties.

Methods

This thesis presents a systematic review and meta-analysis of the literature in relation to the effectiveness of acceptance-based interventions for post treatment cancer survivors, with a particular focus on Mindfulness-Based Interventions (MBI). A cross sectional questionnaire study is then reported which explores the potential role of psychological flexibility in mediating the relationship between FOR and distress and quality of life (QoL) outcomes.

Results

The findings of the review offer tentative support for the effectiveness of MBI in reducing stress and depressive symptoms, while less convincing results emerged for anxiety. Results from the empirical study suggest that while psychological flexibility does not appear to significantly mediate the impact of FOR on distress and QoL, value based living and cognitive fusion did emerge as significant mediating variables within these relationships.

Conclusions

Findings suggest that acceptance-based approaches, may be of benefit in reducing the burden of distress and improving the lives of cancer survivors. Supporting cancer survivors to become less entangled with their thoughts and live in accordance with their values may be particularly beneficial. Further studies using larger samples and longitudinal designs are warranted.

Chapter 1: Systematic Review

Acceptance-Based Interventions for Improving Psychological Well-Being in Post-Treatment Cancer Patients: A Systematic Review and Meta-Analysis

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Systematic Review written in accordance with author guidelines for *The Journal of Cancer Survivorship* (Appendix 6)

Abstract

Purpose

The emotional impact of cancer is increasingly recognised, and with growing numbers of people living with and beyond the diagnosis, it is imperative to develop effective interventions to reduce the burden of psychological distress. Evidence suggests that existing interventions offer only limited benefits. In recent years more contemporary approaches focussing on acceptance and mindfulness have been tested in this population. While such approaches appear to offer promise, to date there has been little specific exploration of the effectiveness of these interventions with people adjusting to life following completion of cancer treatment. The current review therefore aimed to assess the evidence for the effectiveness of Mindfulness-based Interventions (MBI) in post treatment cancer survivors.

Methods

A systematic search of the literature was conducted. Methodological quality of the studies was assessed, and both a meta-analytic and narrative synthesis of the main findings and limitations of the current evidence are presented.

Results

Eleven studies meeting criteria for inclusion were identified. Quantitative synthesis of the eight studies investigating Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cancer Recovery (MBCR) interventions suggested the intervention to be helpful in reducing stress and depressive symptoms. The results were less convincing for effects on anxiety. Findings around the existence of a dose response relationship for MBI, and the role of changes in mindfulness in mediating intervention effects were mixed.

Conclusions

Though findings offer tentative support for the application of MBI in post treatment cancer populations, the relatively small number of studies identified and heterogeneity in measures used limit the conclusions that can be drawn from the

results. Future research to explore potential processes by which MBI effects are achieved are encouraged.

Implications for Cancer Survivors

The current review highlights the potential benefit of mindfulness-based interventions to promoting positive adjustment following treatment for cancer.

Keywords: Cancer survivorship, Mindfulness, Acceptance, Distress

Introduction

Distress in Cancer Patients

In addition to a multitude of physical and practical challenges, it is increasingly acknowledged that being diagnosed with and treated for cancer has a significant emotional impact for many. Indeed, evidence from a large meta-analysis of existing evidence reported prevalence rates of clinical depression of between 8-24% among cancer patients both during and after treatment [1]. Clinical levels of anxiety appear to be similarly prevalent, with one large study of mixed cancer patients in Germany reporting 11.5% to be affected [2]. Interestingly, findings from a large survey of cancer patients within the UK, where patients were asked whether they considered themselves to have experienced anxiety or depression as a result of their cancer diagnosis, reported much higher figures: 75% of individuals reported difficulties with anxiety and 49% reported depression [3]. This suggests that in addition to individuals meeting clinical levels of distress according to validated measurement tools, there are likely to be many more experiencing adjustment difficulties not severe enough to trigger referral to specialist mental health services [4].

For many patients, these psychological difficulties persist long after the completion of treatment, with some evidence suggesting that the risk of anxiety in particular remains higher in cancer survivors compared with healthy controls up to 10 years after diagnosis [5]. The consequences of this can be significant, with reported negative effects on quality of life (QOL), reduced engagement with medical care, and reduced survival [6]. While researchers have identified variations in levels of distress dependent on the measurement used, cancer type and treatment stage [1], taken together, this evidence highlights the importance of addressing the emotional impact of cancer.

Interventions to Improve Psychological Outcomes in Cancer

Over the years, a significant body of research has emerged investigating the efficacy of various psychological interventions aimed at reducing the burden of distress in cancer patients. Many studies have focussed on particular cancer types, with the

literature dominated by studies within breast cancer populations. A recent meta-analysis of all psychological interventions aimed at improving psychosocial outcomes in post-surgical breast cancer patients found Cognitive Behavioural Therapy (CBT) approaches to be the most effective in reducing symptoms of anxiety and depression and improving quality of life [7]. However, pooled mean effect sizes reported by this review were small, and it is limited by its failure to define well specified descriptions of interventions, resulting in a wide range of treatment approaches being analysed together. Further systematic review evidence from studies involving prostate cancer patients [8] looked at individual/group CBT, and supportive-emotional interventions with patients at different stages of disease and treatment. The authors concluded that overall, such interventions appeared to have only small, short-term benefits on disease related aspects of QOL, and no statistically significant improvements in distress, depression or uncertainty. This review also identified a number of limitations to the studies reviewed, including the low quality of evidence, potential ceiling effects due to the inclusion of participants with generally high wellbeing, and uncertainty as to the clinical meaningfulness of observed intervention effects.

Evidence from reviews of psychological interventions across cancer types offers a similarly mixed picture of their effectiveness. A meta-analysis of the effects of group therapy, counselling, education, and CBT by Newell and colleagues [9], concluded that the overall quality of existing studies was low, and only tentative support could be offered for their efficacy. In contrast, another review looking at both CBT and patient education interventions for cancer survivors found no evidence for the efficacy of the education interventions, but reported that CBT led to short term improvements in depression, anxiety and QOL, and sustained (>8months) improvements for QOL. They also reported greater efficacy for individual interventions relative to group interventions within the studies they reviewed [10]. Another, more recent review by Faller *et al.* [11], looked at individual psychotherapy, group psychotherapy, psychoeducation and relaxation training in mixed cancer patients. They reported small to medium overall effects on emotional

distress, anxiety, and depression, which were all sustained at long term follow up for all interventions, with the exception of relaxation training where effects waned over time.

Taken together, the evidence base for psychological interventions in cancer suggests that existing approaches such as CBT, psychoeducation and counselling psychotherapy offer only limited benefit for improving psychological wellbeing and QOL in this group of patients. There remain issues with the quality of the evidence available, and poor specificity around the nature of and active therapeutic ingredients of interventions. In addition, since these reviews more contemporary interventions have been investigated within this population. It is timely therefore to explore such interventions which take different therapeutic approaches, which may have the potential to offer increased benefits to psychological wellbeing for this patient group.

Acceptance-Based Interventions

With advances in anti-cancer treatments and increasing survival rates, cancer is now conceptualised as a chronic condition for many who are diagnosed [12]. This has led to growing recognition of the need to develop interventions aimed at optimising adjustment and helping those living beyond the disease achieve a good quality of life [13-14]. The existence of a range of physical and psychological sequelae following completion of treatment suggest the need for interventions with a focus on helping individuals to live well despite the adversities they are faced with. It is therefore appropriate that in recent years, acceptance-based therapies have been increasingly investigated within this population. Such therapies focus on willingness to experience difficult (or unwanted) sensations, emotions and thoughts, without striving to change them [15]. In this way, acceptance refers not to giving up, but to acceptance of the reality of present experiences, which in the context of cancer may include loss, pain or fears about cancer and death [16].

Though there exists a range of theoretically distinct therapeutic models under the umbrella of acceptance-based approaches, a central component shared by them all is

that of mindfulness. Mindfulness is a process of intentionally bringing conscious awareness of present moment experiences, with a non-judgemental accepting attitude [17]. Put most simply, mindfulness can be conceptualised as a way of being, but it can also be more formally practised through various meditation based exercises. Mindfulness meditation has its roots in Buddhism, but has been introduced as a secular practice within various psychological therapies as a tool for helping individuals increase awareness of the positive and negative experiences which are part of everyday human experience, and help them to respond to these in a more helpful way [18]. Increases in mindful awareness are proposed to increase positive affect, reduce negative affect and contribute to more adaptive coping responses [19].

Recent evidence from a meta-analysis of the effectiveness of Mindfulness-based Interventions (MBI) with people who were physically unwell, people with psychological disorders, and non-clinical populations, reported large positive effects for anxiety and moderate effects for depression [20]. However, while the review found MBI's to be more effective than psycho-education, supportive therapies, relaxation and imagery, it did not find it to be superior to CBT or behavioural interventions alone. In addition, there were moderate to high levels of heterogeneity within the studies included in the analysis. Therefore, while mindfulness interventions appear to offer promise for improving psychological wellbeing, further work is required to ascertain the relative efficacy offered by this approach over existing therapies.

Mindfulness-Based Stress Reduction

The most widely used standardised mindfulness intervention is that of Mindfulness-based Stress Reduction (MBSR). Developed in 1979 by Jon Kabat-Zinn [21], MBSR consists of a structured eight to ten-week mindfulness training program, delivered within a group setting. Weekly sessions generally last 2.5 hours and include instruction and experiential practice of a variety of mindfulness meditation exercises, including sitting and walking meditation, body scan meditation, and

yoga. Educational materials are also provided on stress and coping, relaxation, meditation and the connection between body and mind. Sessions also provide opportunities for group discussion, with an aim of sharing experiences and overcoming barriers to successful integration of mindfulness into everyday life. The program has a strong home practice element, with participants encouraged to practise mindfulness skills for a minimum of 45 minutes, six days a week. In addition, in its original form, MBSR typically offers a whole day intensive mindfulness retreat towards the end of the course [21]. MBSR has been applied within a variety of populations with an overall aim of relieving suffering associated with physical and emotional difficulties, through increasing openness and awareness [22].

Mindfulness-Based Approaches in Cancer

There has been growing interest in the application of MBSR within cancer populations over the last few decades. Alongside this a parallel cancer specific, mindfulness program, Mindfulness-based Cancer Recovery (MBCR), has been developed and tested. The intervention bears strong resemblance to the MBSR program, with a similar structured approach and use of mindfulness meditation training and home practise [23]. The program was developed to support patients following cancer diagnosis and during treatment, and was adapted from the MBSR format accordingly with patients' physical health in mind. In practice, there appears to be little discernible difference in the two therapeutic modalities, and many studies purporting to use a MBSR intervention adapt the intervention accordingly for cancer populations.

Evidence for Mindfulness-Based Therapy in Cancer

Over recent years, increasing numbers of studies have been published investigating the effectiveness of Mindfulness-based Therapies with cancer populations. Again, much of the evidence base is dominated by research involving breast cancer patients, and a number of reviews of this evidence have been produced. Matchim and colleagues in their review of studies of MBSR, using mainly pre-post designs,

reported large effects on perceived stress and anxiety, and medium effects on reducing stress symptoms and overall mood disturbance [24]. Similarly, another meta-analytic review looking at controlled studies of both MBSR and MBCT reported small pooled effect sizes for depression and medium effects for anxiety [25]. A further meta-analysis reported moderate to large effect sizes for MBSR on outcomes of stress, depression and anxiety [26].

Within mixed cancer populations, an early systematic review of controlled, uncontrolled and qualitative studies of MBI's found good evidence to suggest their efficacy in reducing anxiety and distress, and mixed findings for their impact on depression [27]. Further evidence from a number of quantitative syntheses of the available evidence suggest similar promising effects. Ledesma *et al* [28] reported moderate effect sizes for improvements in mental health, and a smaller effect on physical health outcomes, while a further meta-analysis by Musial and colleagues [29] reported a small but positive overall effect on QOL, a small to medium effect on mood, and a medium effect on emotional distress.

A notable limitation of these reviews is their inclusion of both Randomised Controlled Trials (RCT) and observational studies, and the grouping together of different aspects of psychological wellbeing in their analysis. This limits the conclusions that can be made about the relative effects of the intervention on different aspects of psychological functioning. In contrast, a meta-analysis by Piet *et al* [30] considered the effectiveness of MBSR and MBCT on anxiety and depression specifically, and reported moderate effect sizes on both outcomes. This review included both patients undergoing treatment and post-treatment survivors, but analysis did not distinguish the effects between the two groups, so no conclusions can be drawn about the impact of treatment status on findings. Despite this, a major advantage of this review was that it explored improvements in mindfulness following the interventions, reporting a small significant positive effect. This provides some evidence in support of the proposition that mindfulness mediates the improved anxiety and depression outcomes following MBI's. More recently, a

further meta-analytic review of MBI's which also specifically investigated the outcomes of anxiety and depression found significant effects for reducing symptoms of anxiety, and larger effects for depression [31]. However, as the authors highlighted, they did not account for the influence of cancer stage and severity of psychological symptoms at baseline, both of which could be usefully explored as potential moderating variables.

Limitations of the Current Evidence for MBI's in Cancer

Though the growing interest in the application of MBI's within cancer settings appears warranted, there are a number of limitations to the existing evidence base which limit the conclusions which can currently be drawn. Firstly, translating findings about the effectiveness of MBI's to specific groups of cancer patients is challenging, as the majority of reviews have included patients at different stages of treatment, and many have included only breast cancer patients [24-26]. There is evidence to suggest that distress levels vary across the clinical course of cancer [32-34], and intuitively, it could be argued that intervention targets may differ for patients who continue to undergo treatment compared to those who have completed curative treatment and are adapting to life as a cancer survivor. Indeed, there is some specific evidence to suggest the potential importance of the timing of MBI delivery. In their recent study of brief MBI versus relaxation within patients undergoing chemotherapy treatment, Reynolds and colleagues [35] reported that participants in the mindfulness group experienced an unexpected increase in physical symptom distress which was not observed in the relaxation group. In light of these findings, the authors caution against the use of mindfulness-based interventions, which can promote increased awareness of difficult physical experiences, during intensive anti-cancer treatment when there may be less opportunity for such practises to be maintained and supported.

A further consideration which has been addressed by increasing numbers of studies but so far neglected within syntheses of the literature is around examining the dose response relationship, suggesting the 'amount' of a given psychological therapy

required to evoke clinically meaningful change [36]. Elucidation of this is particularly important given the current financial challenges faced by public sector mental health services in the UK, where in clinical practice interventions seek to deliver the greatest improvement for the least intensive input [37].

Finally, it is of note that to date, studies exploring the effectiveness of MBI's have largely focussed on the reduction of negative psychological symptoms, such as stress, anxiety and depression. While a valid aim and one which has been the scientific norm for a number of decades, this focus limits investigation of alternative benefits, such as increases in positive psychological outcomes [38]. This is particularly relevant when considering the application of acceptance-based interventions, which by their very nature move away from traditional attempts to 'get rid of' unwanted emotional and physical experiences, focussing instead on moving towards achieving meaningful valued lives despite such experiences.

Aims of the Current Review

To date, no systematic review of the literature for acceptance or mindfulness-based interventions specifically in post treatment cancer survivors has been published. Though theoretical distinctions can be made between various acceptance-based therapies, they share an overarching focus on improving functioning in the context of difficult physical and emotional experiences, and a common shared component of mindfulness. In light of the limited evidence for the effectiveness of existing interventions, and the potential utility of this approach to meet the needs of the growing population of post treatment cancer survivors, it is timely to assess the evidence for such approaches in this review.

The current review therefore aims to systematically examine the evidence for mindfulness-based interventions among post-treatment cancer survivors. Specifically, it aims to quantitatively summarise, using a meta-analytic approach, the effectiveness of such interventions on improving psychological outcomes of anxiety, depression, stress, cancer specific distress and fears of cancer recurrence. Two supplementary aims are to summarise the evidence for possible dose response

effects of the interventions, and to summarise the evidence for positive psychological outcomes. The amount of available data relating to these supplementary aims were predicted to be too small to allow quantitative synthesis, so a narrative synthesis was planned.

Method

Literature Search

The procedure for conducting the review was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [39]. The search strategy was developed following an iterative process involving exploratory searches to establish the current state of the evidence base, and consultation with an expert librarian. Searches of The Cochrane Database of Abstracts of Reviews of Effects (DARE), and the International Prospective Register of Systematic Reviews (PROSPERO) were carried out before beginning the review, to identify any published or in process reviews of the same topic. None were found, confirming a gap in existing evidence for the current review topic.

Final searches were run on the 25th May 2017, using databases selected according to the review question; EMBASE (1980 – 2017 week 21), PsychINFO (1806-May Week 3 2017), Ovid MEDLINE (R) daily and Ovid MEDLINE (R) (1946 -present), CINAHL Plus, and the Cochrane Central Register of Controlled Trials (CENTRAL). The following search terms were used: mindful* or MBSR or MBCT or meditat* OR "acceptance-based" or "acceptance therap*" or "acceptance and commitment" AND "neoplasm*" or "cancer*" or "oncolog*" or "tumo*" or "malig*" or "haemat*" or "hemato*" or "leuk*" or "carcinoma*" or "melanoma*" AND "anxi*" or "depress*" or "distress*" or "affective disord*" or "mood disord*" or "stress" or "wellbeing" or "quality of life" AND "survivor*" or "post treatment" or "follow up".

In an attempt to reduce potential publication bias as much as possible, a number of strategies were used to identify relevant grey literature. Firstly, the ProQuest Dissertations and Theses Global Database was searched for relevant dissertation

and theses abstracts, and web searches were conducted to identify other relevant unpublished dissertation or theses. Secondly, authors of protocols and conference abstracts were contacted to enquire about additional studies or unpublished results. Thirdly, a search of clinicaltrials.gov was conducted to identify any unpublished completed trials. Finally, the references of all identified papers meeting review criteria were screened for any additional papers. The review was restricted to English language papers only, due to limited resources, however attempts were made to contact authors of any non-English language papers to establish if a translated copy was available.

Study Selection Process

Selection of papers to be included in the review was aided by the use of a 'PICO' table; a method recommended for the development of a well-defined and precise review question. The PICO table covers the Population; Intervention; Comparator; and Outcomes of interest [40]. The PICO table developed for the current review is presented in *Appendix 1*. Search results were subject to review by the first author and in instances where there was uncertainty over study details, clarity was sought from authors by e-mail. To increase the reliability of the selection process, a random sample of 30% of full text records screened were second rated by a fellow doctoral student in Clinical Psychology with experience in Clinical Health Psychology research and practice (EB). Any discrepancies between ratings were resolved through discussion.

Definition of Terms & Inclusion Criteria

Definitions of the cancer survivor population differ widely, including; cancer patients from the day of diagnosis [41], all cancer patients and their immediate family members [42], or patients only from the point of completion of treatment until end of life [43]. Studies purporting to include cancer survivor populations can therefore encompass one of a number of groups depending on the definition used. For the purposes of inclusion in this review, cancer survivors were defined as individuals who had received a diagnosis of cancer and had completed primary

curative cancer treatment (those who continued to receive hormonal treatment were also included).

This review was interested in what are often referred to as third wave therapies. Such approaches, described by Hayes as 'Contextual Cognitive Behavioural Therapy' (CCBT) "*emphasize the context and function of psychological events more so than their validity, frequency, or form*" [44, pp.141]. With this description in mind, a broad definition of mindfulness-based interventions was applied to include interventions with a standardised format such as Mindfulness-based Stress Reduction (MBSR) [21] and Mindfulness-based Cognitive Therapy (MBCT) [23]; Acceptance and Commitment Therapy (ACT) [15]; and other adapted interventions containing a core component of mindfulness.

With these definitions in mind, studies were included according to the following criteria:

- Inclusion of males and females, aged 18 years of over at the time of cancer diagnosis (no upper age limit)
- Inclusion of participants who were post-treatment cancer survivors of any cancer type (no time limit post treatment)
- Mindfulness-based interventions, i.e. interventions containing a central element of mindfulness
- Aimed at improving psychological wellbeing and or quality of life or adaptive functioning following cancer treatment
- Delivered by professionals with appropriate training and/or experience, and containing an interactive therapeutic component
- Delivered in group or individual settings, face to face or via the internet or other technology media
- Measuring at least one of the following psychological outcomes, using established validated measures carried out on at least two occasions (pre-and-post intervention): Distress (e.g. anxiety and/or depression); Fear of

recurrence (measured using specific fear of recurrence measure); Positive psychological processes (e.g. post traumatic growth)

- Studies utilising an RCT design, including one or more comparison groups

Data Extraction & Coding

The following data were extracted from the selected studies: Source details (published/unpublished, authors, year of publication, source of publication, country); sample size; population demographics (age, sex, cancer type, treatment type(s) received, time since diagnosis, treatment completion); setting in which recruitment took place; intervention description (including who delivered the intervention and details of any fidelity and adherence measures); study design; randomisation, blinding and control group details; attrition; outcome measures recorded and measurement time points; statistical analyses conducted; and summary of key findings.

Quality Review

The quality criteria developed for this review were established *a priori*, and were adapted from the Cochrane Risk of Bias Tool [45] and Scottish Intercollegiate Guidelines Network Critical Appraisal Checklist for Controlled Trials (SIGN 50) [46]. Criteria were selected based on their relevance to the review question, and contained eleven items on which studies were rated as 'Well Addressed (+)', 'Poorly Addressed (-)' or 'Unable to say (?)'. Studies were not allocated an overall quality score, in line with current recommendations which suggest that weighting studies in this way may be misleading [40, 47]. Rather, descriptive overall quality ratings were given according to the degree to which studies met the pre-defined criteria, these were 'High Quality ++', 'Acceptable Quality+' and 'Low Quality 0'. *Appendix 2* presents the descriptive definitions outlining how each criterion was operationalised. All quality ratings were performed by the first author. In addition, in order to increase reliability of the process, a random selection of 36% of papers (n=4) were second rated by the same second-rater described earlier (EB). Initial inter-rater agreement was reached on 82% of quality criteria scores, indicating and

acceptable level of agreement. Any discrepancies were reviewed and resolved through discussion.

Quantitative Synthesis of Main Findings

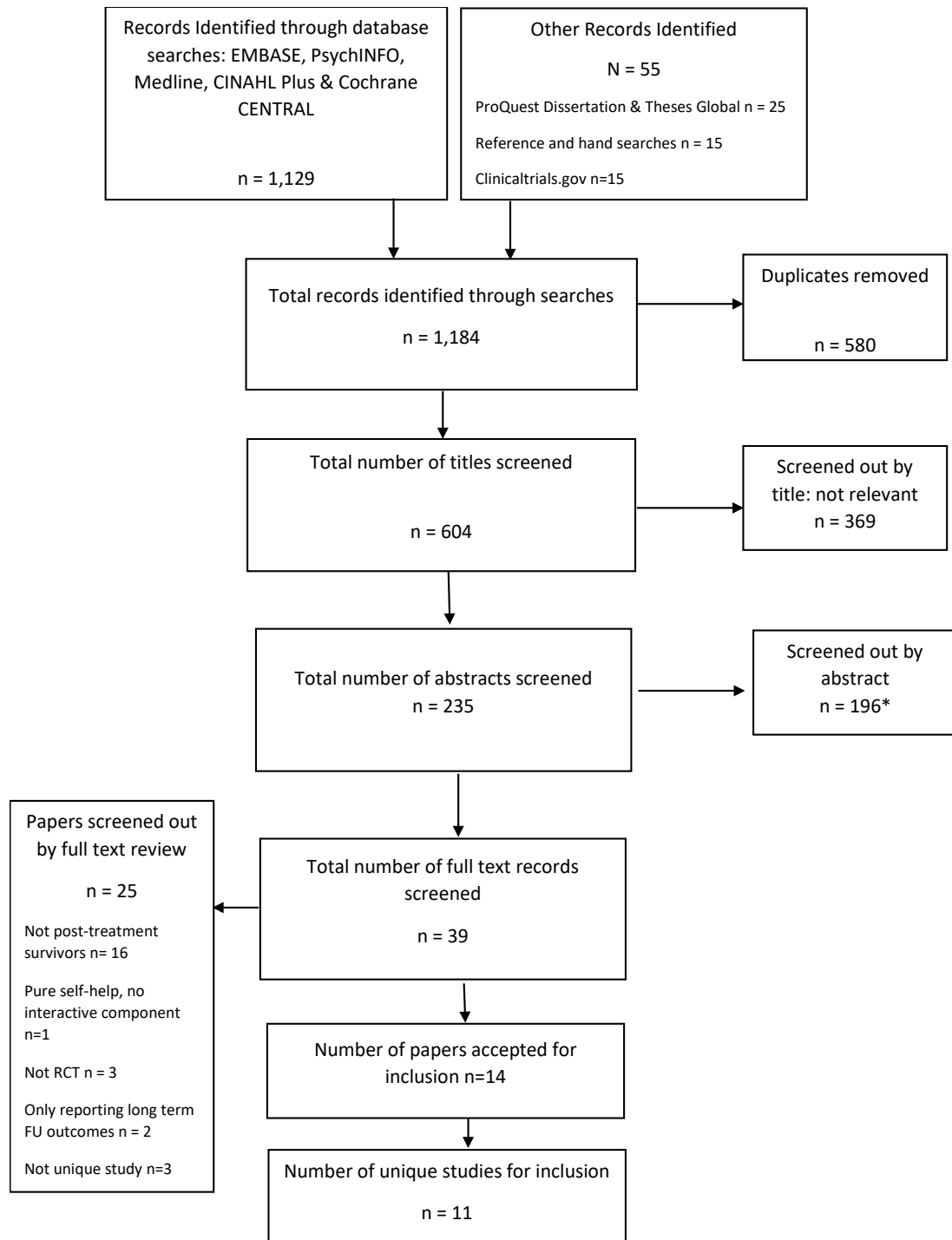
All statistical analyses were conducted using the Quality Effects (QE) model within MetaXL [48]. This model incorporates weightings based on the quality assessment of studies, and was selected over the Random Effects models as it has been suggested to provide a more robust estimate of effect size and confidence intervals regardless of heterogeneity levels [49]. Published post intervention means and standard deviations for the variables of interest were entered into the analysis to produce standardized mean differences (SMD). Hedges g was selected as the effect size statistic, for its ability to allow comparisons between differing outcome measures by pooling variances [50]. In cases where the standard deviation was not reported, figures were calculated using confidence intervals [40]. Conventional effect size interpretations were used, with 0.2 representing a small effect, 0.5 a medium effect and 0.8 a large effect [51]. In two studies, there was more than one comparison group [52-53]. As the additional comparison groups could not intuitively be collapsed into either active intervention or no treatment control, two comparisons were made for each study between the mindfulness intervention and each of the control groups, with the total n of participants in the mindfulness group split and shared between the two groups [40]. The current review was focused on immediate intervention effects, therefore only immediate post treatment data were examined.

Variability between studies was assessed using two established statistical methods for calculating levels of heterogeneity. Firstly, the p -value for the Cochran's Q test statistic was examined, with significant p values suggesting the presence of heterogeneity between studies. As this test is known to have limited power in detecting heterogeneity, a cut off of $p > 0.1$ was set for defining significance [54]. In addition, the I^2 measure was used as a further indication of heterogeneity. This provides an indication of the percentage of variation between studies due to real

difference rather than chance, and has the advantage of not being affected by the number of studies included within the analysis [50].

Selective outcome reporting was assessed via the visual inspection of funnel plots, to identify the distribution of positive and negative effects for selected studies. Publication bias is indicated by the presence of a high proportion of effect sizes towards the bottom right hand side of the funnel plot [50]. Further statistical tests for asymmetry were not conducted (e.g. [55]) due to insufficient numbers of studies being included within the meta-analysis [40].

Figure 1a. Flow chart of study screening and selection processes



*See table 1 for list of exclusion reasons

Results

Figure 1a. provides a flow chart summarising the study selection process. The combined searches identified a total of 1,184 records, of which 580 were excluded as duplicates and a further 369 were excluded by title as not relevant. This left 235 records which were screened by abstract. For transparency, reasons for exclusion of papers by abstract are presented in *Table 1a*. At this stage, authors of protocols and conference abstracts where no published outcome paper was found were contacted by e-mail where possible. A full text screen was then carried out for records where abstracts indicated potential eligibility for inclusion (n=39), including cases where there was ambiguity around eligibility. The majority of papers were excluded at this stage due to inclusion of cancer patients during active treatment. A final selection of 14 papers met criteria for inclusion in the review, describing 11 unique studies. *Table 2a.* provides a summary of key information from each study.

Table 1a. Reasons for exclusion of records by abstract

Exclusion Reasons (n = 175)
Not RCT
Paediatric cancer patients
Not cancer patients
Participants currently undergoing primary treatment
Advanced / metastatic disease
No explicit mindfulness / acceptance component to intervention OR Mindfulness only minor element of intervention
Intervention targeting specific symptom (e.g. cognitive impairment / sexual dysfunction / menopausal symptoms / insomnia / weight / diet / physical activity)
No distress or QOL outcome measures
Non-interventional study
Qualitative results only
Review paper
Conference abstract only available (following e-mail to lead author to enquire about available unpublished data)
Study protocol
Full paper not available (or not available in English)

Table 2a. Summary of studies investigating the effectiveness of mindfulness-based interventions in post treatment cancer survivors

<i>Study</i>	<i>Population</i>	<i>Setting</i>	<i>Intervention</i>	<i>Outcome measures</i>	<i>Key findings</i>
<i>Blaes et al. (2016) [56]</i>	<i>N= 42 (28 MBCR, 14 Control)</i>	<i>University Cancer Center</i>	<i>Group MBCR vs WLC</i>	<i>State anxiety (STAI – state scale)</i>	<i>Results from t-test analysis:</i>
<i>USA</i>	<i>Mixed cancer type (69% Breast)</i>		<i>Face to face delivery</i>	<i>Self-Compassion (SCS – short form)</i>	<i>Anxiety increased in control group, decreased in MBCR group from pre-to-post (within group p=.07 ns).</i>
	<i>90% Female</i>		<i>Delivered by staff with extensive training and certification in MBSR, trained in MBCR by expert</i>		<i>Data not reported for self-compassion scale – short form</i>
	<i>Mean Age 55 (MBCR) 57 (Control) (range 36-79years)</i>				
	<i>Time since treatment completion not reported (eligibility for inclusion - within 6 months)</i>				<i>Low to moderate correlation between home practice and all study outcomes (individual correlation</i>

			Study attrition: 14%		coefficients and p values not reported)
			Adherence: 79% attended \geq 7 sessions		
			Mean home practice: 40min 5days/week (data from n=16)		
Main paper: Bower et al. (2016) [57]	N=71 (39 MAPS, 32 Control) All breast cancer	University recruited sample from previous study	Group Mindfulness (MAPS) vs WLC	Perceived Stress (PSS) Depressive Symptoms (CES-D) Fear of	Results from linear mixed effects models analysis: Significant improvement in perceived stress in MAPS relative to control ($p=.004$ effect size .67) Non- significant trend towards
Secondary Paper: Boyle et al. (2017) [58]	100% female Mean age 46.1 (MAPS) 47.7 (Control)	on healthy eating and physical activity +	Face to face delivery		

USA		physician	Delivered by	recurrence	improvements in depressive
	Time since treatment	referrals +	expert with	(QLACS)	symptoms ($p=.095$ effect size
	completion not reported	internet	>10yrs MAPS		.54).
		recruitment	experience	Intrusive	
				thoughts	Significant improvement in
			Study attrition:	(IES)	positive affect ($p<.05$ effect
			18%		size not reported) and peace
				Positive affect	and meaning ($p<.01$ effect
			Adherence:	(PANAS-PA)	size not reported)
			Mean MAPS		
			attendance 5.24	Meaning and	No significant effect for
			sessions (range	peace	cancer specific distress
			2-6)	(FACIT)	$p=.385$ ns, or fear of
					recurrence $p=.128$ ns.
			Mean total mins		
			mindfulness		Dose response analysis:
			practice (class +		Linear regression analysis
			home): 897 (305-		revealed minutes of practice
			1527)		not associated with stress or

	depressive symptoms ($p > .05$)
Additional measures from mediation sub-study, $n=71$): Rumination (RRS)	Mediation analysis: Significant indirect effects mediating path between intervention effect and depressive symptoms for rumination ($\beta = -2.03(1.14)$, self-kindness ($\beta = -$ $4.45(1.51)$, and mindfulness ($\beta = -3.17(1.43)$). Within multiple mediation model – self-kindness remained as significant mediator ($\beta = -$ $3.51(1.48)$. Only self-kindness mediated intervention effects on perceived stress ($\beta = -$
Self-kindness (SCS)	
Mindfulness (FFMQ)	

					2.53(1.20).
<i>Branstrom et al</i>	<i>N=85 (32 MBSR, 39 Control)</i>	<i>Advert and</i>	<i>Group MBSR vs</i>	<i>Perceived</i>	<i>Results from MANCOVA</i>
<i>(2010) [59]</i>		<i>emailing via</i>	<i>WLC</i>	<i>Stress (PSS)</i>	<i>analysis:</i>
	<i>Mixed cancer types (76%</i>	<i>cancer patient</i>			
<i>Sweden</i>	<i>Breast)</i>	<i>organisations</i>	<i>Face to face</i>	<i>Mood</i>	<i>Significant interaction time</i>
			<i>delivery</i>	<i>(HADS)</i>	<i>x group (F (7,60)=2.27,</i>
	<i>99% Female</i>				<i>p<0.05) showing greater</i>
			<i>Delivered by 2</i>	<i>Post-</i>	<i>reduction in psychological</i>
	<i>Mean age 51.8 years (SD 9.86)</i>		<i>Clinical</i>	<i>traumatic</i>	<i>distress and increase in</i>
			<i>Psychologists</i>	<i>stress</i>	<i>positive states of mind in</i>
	<i>Time since treatment</i>		<i>trained in CBT</i>	<i>symptoms</i>	<i>MBSR group relative to</i>
	<i>completion not reported</i>		<i>(only 1 had</i>	<i>(IES)</i>	<i>controls (effect size partial</i>
			<i>training in</i>		<i>η2 = 0.21) .</i>
			<i>MBSR, neither</i>	<i>Positive</i>	<i>No significant main effect of</i>
			<i>had experience</i>	<i>States of</i>	<i>time or group.</i>
			<i>delivering</i>	<i>Mind</i>	
			<i>MBSR)</i>	<i>(PSOM)</i>	<i>Univariate tests showed</i>
					<i>significantly larger</i>
			<i>Study attrition:</i>	<i>Mediator:</i>	<i>reductions in MBSR group</i>

29%	Mindfulness	on perceived stress
	(FFMQ)	(F(1,66)=8.79, $p<0.01$,
Attendance:		partial $\eta^2 = 0.12$), positive
25%-all sessions		states of mind
22%-seven		(F(1,66)=5.40, $p=0.023$,
sessions		partial $\eta^2 =0.08$) , and IES
25%-six sessions		avoidance (F(1,66)=6.61,
6%-five sessions		$p<0.05$, partial $\eta^2 = 0.09$).
6%-four sessions		
9%-three		Significant interaction time
sessions		x group on mindfulness
6%-no sessions		(FFMQ) (F(5,62)=3.45,
		$p<0.05$, partial $\eta^2 = 0.22$).
Home		No significant main effect of
meditation		time or group. Univariate
practice:		tests showed significant
60% - regular		time x group interactions
28% moderate		for all subscales of the
12% - infrequent		FFMQ, demonstrating

					greater pre-post increases in mindfulness in MBSR relative to controls.
					Mediation analysis (whole sample): Indicated that levels mindfulness mediated the effect of the intervention on perceived stress ($\beta = -0.23, p < 0.05$), positive states of mind ($\beta = 0.23, p < 0.05$) and IES avoidance ($\beta = -0.22, p < 0.01$)
Carlson et al. Main paper (2013) [52]	N=271 (113 MBCR, 104 SET, 54 SMS)	Breast Cancer Clinics + media adverts +	Group MBCR vs SET vs non-active control	Mood (POMS)	Results from linear mixed models analysis:
Secondary paper: Schellekens et al. (2017) [60]	All breast cancer 100% female	publicity + community outreach +	(SMS) Face to face	Stress (CSOSI)	Significant group x time interaction for mood, small effect size ($\eta^2 =$

Canada		direct mailing	delivery	0.020, $p < .05$), however no
	Mean age 54.66 (MBCR) 53.62	via cancer		significant difference
	(SET) 56.27 (SMS)	registry	Both active	between MBSR – SET
			interventions	($p = .024ns$), or MBSR –
	Time since treatment		delivered by staff	SMS ($p = .051ns$) in pairwise
	completion not reported (at		with training	comparisons
	least 3 months for inclusion)		and experience	
			in the therapy	Significant group x time
				interaction for stress, small
			Study attrition:	effect size ($\eta^2 = 0.043$,
			32%	$p < .05$). Pairwise
				comparisons showed greater
				reductions in stress after
			Attendance not	MBCR (mean change -
			reported for	19.30) compared with both
			whole sample	SET (-9.46, $p < 0.05$, and
				SMS (8.87, $p < 0.05$).
			Mean practice	
			time not	
		Secondary		Mindfulness included in

			<i>reported for whole sample</i>	<i>mediation paper (on MBSR & SET intervention completers only): Mindfulness (MAAS)</i>	<i>sub study as potential mediator. Results showed mindfulness did not increase significantly from pre to post intervention (F (1, 124) =.026, p=.872ns). Therefore no further mediation analysis on this variable performed.</i>
<i>Hoffman et al. (2012) [61]</i>	<i>N= 229 (114 MBSR 115 Controls)</i>	<i>Via charity run day care centre providing free psychological and integrative therapies for breast cancer patients</i>	<i>Group MBSR vs WLC</i>	<i>Mood (POMS)</i>	<i>Results of repeated measures ANOVA analysis:</i>
<i>UK</i>	<i>All breast Cancer</i>	<i>100% female</i>	<i>Face to face delivery</i>	<i>Delivered by qualified MBSR instructor with experience,</i>	<i>Significantly lower mood disturbance (total POMS) in MBSR group relative to controls at post intervention (p<.001). No significant interaction for time x group (p=.558ns)</i>
	<i>Mean (SD) age 49.0 (9.26) MBSR; 50.1 (9.14) Control</i>				

	Time since treatment completion Mean months (SD) MBSR 9.27 (6) Control 9.50 (6)		under supervision		Dose related effect (multiple linear regression): increased hours of home practice were not significantly associated with improved mood at post intervention.
			Study attrition: 15%		
			Group Attendance: mean 6.26 sessions (2.12 SD)		
			Total mean hours formal home practice: 19.58 (SD 11.49)		
Main paper: Lengacher et al.	N=84 (41 MBSR, 43 Control)	Cancer center and research	Group MBSR vs WLC	State & Trait Anxiety	Results from ITT ANCOVA analyses:

(2009) [62]	Breast Cancer only	institute	(STAI – both	
		Face to face	scales)	MBSR showed significantly
Secondary paper:	100% female			better adjusted mean scores
Lengacher et al. (2014) [63]		Delivered by	Depression	post treatment for state
	Age:	MBSR trained	(CES-D)	anxiety ($p<.05$), trait
USA	<55 39.3%	psychologist		anxiety ($p<.01$), depressive
	55-64 33.3%		Perceived	symptoms ($p<.01$), fear of
	65 or older 27.4%	Attrition: 2%	Stress (PSS)	recurrence ($p<.05$),
				recurrence concerns ($p<.01$).
	Time since treatment	Adherence:	Fear of	F statistic and effect sizes
	completion mean (SD) weeks	85% attended	recurrence	not reported.
	18.8 (17.4)	>75% classes	(CARS)	
				No significant differences
		Total mean	Optimism	found for perceived stress or
		hours practice	(LOT)	optimism.
		time (group +		
		home): 18.0 (SD		Dose response analysis
		11.5) (data from		(using general linear
		n=39)		models) of ‘compliers vs

			70% classed as 'compliant'		<p><i>non-compliers': Increased practice time was correlated with larger reductions in perceived stress ($r=0.33$, $p<.05$),</i></p> <p><i>An inverse relationship between minutes practiced and positive changes in optimism was found ($r=-0.32$, $p<0.05$).</i></p>
				Secondary mediation analysis paper ($n=82$)	<p><i>Mediation analysis: fear of recurrence significantly mediated the effect of MBSR on perceived stress ($z=2.12$, $p<.05$) and state anxiety ($z=2.03$, $p<.05$).</i></p>
Lengacher et al. (2016) [64]	N=322 (167 MBSR, 155 Control)	Three cancer / healthcare	Group MBSR vs WLC	Depression (CES-D)	Results from linear mixed models analysis:

<hr/>				
		<i>centers</i>		
USA	<i>All breast cancer</i>	<i>Face to face delivery</i>	<i>State Anxiety (STAI – state subscale)</i>	<i>MBSR group showed significantly greater improvements in anxiety</i>
	<i>100% female</i>	<i>Delivered by clinical psychologist</i>		<i>(d=.26, p<.05), and fear of recurrence (d=.30, p<.001) relative to controls.</i>
	<i>Mean age 56.6 (SD 9.7)</i>	<i>trained in MBSR</i>	<i>Stress (PSS)</i>	<i>Trend for greater improvement in depressive symptoms for MBSR group</i>
	<i>Time since treatment completion mean days 231 (180)</i>	<i>Study attrition: 9%</i>	<i>Fear of recurrence (CARS)</i>	<i>but this was non-significant (d=.20, p=.06ns).</i>
		<i>Adherence: Compliance defined at 75% attendance and 75% homework completion</i>		<i>Significant moderation effect of higher stress at baseline leading to increased improvement in fear of recurrence scores following MBSR (p<.001)</i>
<hr/>				

			'majority were compliant'		Dose response: no significant moderation effect of compliance on anxiety or fear of recurrence ($p>0.05$).
			Total practice time: Not reported		
Zernicke et al. (2014) [65]	N=62 (30 MBCR 30 WLC)	Adverts + community outreach + direct mailing via registry	Group MBCR vs WLC	Mood (POMS)	Results of linear mixed models analyses:
Canada	Mixed cancer types (34% breast)		Online delivery (synchronous format)	Stress (CSOSI)	Significant time x group interaction ($F(1,113) = 3.95, p<.05$) for total mood disturbance scores.
	73% female			Post	
	Mean age (SD) MBCR 58 (8.2) Control 58 (13.0)		Delivered by clinician with 15yrs experience	Traumatic Growth (PGI)	Simple effects showed significantly reduced total mood disturbance scores for
	Time since treatment completion not reported (within 3 years eligibility for		teaching online MBSR, trained in MBCR	Mindfulness (FFMQ)	MBCR group relative to controls ($d=.44, p<.01$).

<i>inclusion)</i>		
	<i>Study attrition:</i>	<i>Significant time x group effect for stress scores</i>
	<i>8%</i>	<i>(F(1,113)=5.48, p<.01).</i>
		<i>Simple effects showed</i>
	<i>Adherence:</i>	<i>significantly reduced stress</i>
	<i>83% completed ≥</i>	<i>scores for MBCR relative to</i>
	<i>5 classes</i>	<i>controls (d=.49, p<.01).</i>
	<i>Mean online</i>	
	<i>classes attended</i>	<i>Significant main effect of</i>
	<i>6.0 (SD 3.0)</i>	<i>time for post traumatic</i>
		<i>growth (F (1, 113) = 19.69,</i>
	<i>Mean home</i>	<i>p<.001). However, no</i>
	<i>practice (not</i>	<i>significant difference</i>
	<i>including class</i>	<i>between groups for increase</i>
	<i>time) 150m/week</i>	<i>in post-traumatic growth.</i>
		<i>Significant time x group</i>
		<i>interaction for mindful</i>
		<i>acting with awareness (F</i>

					(1,113) = 5.11, $p<.05$). Increased from pre to post for MBSR group ($p<0.05$). Main effect of time for all other subscale scores of FFMQ.
Sarenmalm et al. (2017) [53]	N= 177 (66 MBSR, 57 Active Control, 54 Non-MBSR)	Recruited via research nurses in clinical cancer treatment setting	Group MBSR vs Active Control (self-instructing MBSR) vs Non MBSR	Mood (HADS) Coping Capacity (SOC)	Results from non- parametric analyses for differences between and within groups: Significant within group improvements in depressive symptoms for MBSR group (mean 4.3(SD3.7) to 3.3(3.3), $p<0.01$).
Sweden	All breast Cancer 100% female Mean age (SD) 57.2 years (10.2) (range 34-80 years)		Face to face delivery Delivered by certified MBSR instructors (nurses with	Mindfulness (FFMQ- Swedish version) Personal	Between group tests – significant reduction in

<i>extensive training, practice and examination)</i>	<i>Growth (PTGI)</i>	<i>depressive symptoms in MBSR and active controls vs non MBSR ($p<.05$)</i>
<i>Study attrition: 6%</i>		<i>Reduced 'cases' of depression (HADS D scores of 11-21) were 11% MBSR vs 8% in active controls and non MBSR.</i>
<i>Adherence: Not reported</i>		<i>No significant within or between group effects for HADS anxiety.</i>
<i>Total practice time: Not reported</i>		<i>No significant within group effect for MBSR on coping capacity. However, MBSR ptpts showed significantly improved coping capacity vs non MBSR controls ($p<.05$).</i>

Significant within group differences in MBSR group for 'non-reactivity' (2.9(0.7) vs 3.3(0.5), $p < .001$), and 'observe' (3.3(0.7) vs 3.6(0.5), $p < .001$) facets of mindfulness. Significant within group difference for active controls in 'observe' (3.3(0.7) vs 3.4(0.7), $p < 0.05$).

Significant between group difference between MBSR-Active controls and non-MBSR controls for non-reactivity ($p < .05$), and observe ($p < .05$) facets of mindfulness

					<i>Significant within group change in personal growth for MBSR group (59.78(19.5) vs 64.65(17.7), p<0.05). Significant between group difference between MBSR -active control vs non MBSR (p<.05).</i>
<i>Crane-Okada et al. (2012) [66]</i>	<i>N= 49 (30 MM, 19 control)</i>	<i>Word of mouth + adverts in</i>	<i>Group Mindful movement vs</i>	<i>Mood (HADS)</i>	<i>Results of repeated measures ANOVA analyses:</i>
<i>USA</i>	<i>All breast Cancer</i>	<i>local papers + flyers at:</i>	<i>TAU (offered 3- hour MM class at end of study)</i>	<i>Fear of recurrence</i>	<i>Significant intervention effect on fear of recurrence (p<.05) and mindful attitude p<.05)</i>
	<i>100% female</i>	<i>community meetings,</i>	<i>Face to face delivery</i>	<i>Questionnaire (FRQ)</i>	
	<i>Mean age MM 66.1, Control 64.8 (range 50-90)</i>	<i>senior centres, breast cancer support and</i>		<i>Mindful</i>	<i>All other variables non-</i>

<i>Mean time since treatment completion not reported (at least 12 months for inclusion)</i>	<i>service groups, 'where possible clinical care settings'</i>	<i>Delivered by instructor with training & experience in MM</i>	<i>attention (MAAS) Mindful attitude (SCS, FFMQ)</i>	<i>significant</i>
		<i>Study attrition:</i>		
		<i>14%</i>		
		<i>Adherence:</i>		
		<i>Overall group attendance</i>		
		<i>64.1%</i>		
		<i>Total home practice mean minutes (SD):</i>		
		<i>Weeks 1-4 –82.6 (44.5)</i>		

				Weeks 5-8 – 52.5 (86.0)	
				Weeks 9-12 – 42.6(76.6)	
<i>Dodds et al. (2015) [67]</i>	<i>N= 33 (16 CBCT, 17 Control)</i>	<i>Breast cancer patients taking part in existing studies and psychosocial programs via cancer centre + Media adverts via cancer centre webpage and in print local newspapers</i>	<i>Cognitively based compassion therapy (CBCT) vs WLC Face to face delivery Delivered by clinically trained PhD social worker with 20 years of experience and</i>	<i>Stress (PSS-4) Depression (CES-D) Fear of recurrence (FCRI) Cancer specific distress (IES-R)</i>	<i>Results of ANCOVA analyses: Significant reductions for CBCT group in depression: -3.7,95% CI (-6.3—1.1), $p<.01$), functional impairment scale of fear of cancer recurrence (-1.3, 95% CI -2.5 - -0.1, $p<.05$) traumatic stress avoidance (-0.3, 95% CI -0.6—0.02, $p<.05$), and enhanced mindful presence (3.6, 95% CI 1.2 – 6.0, $p<.05$).</i>
<i>USA</i>	<i>All breast Cancer 100% female Mean age (SD) CBCT 54.7 (12.1) Control 55.8 (9.7) Mean time since treatment completion not reported</i>				

	<i>certification in</i>	<i>Loneliness</i>	
	<i>CBCT</i>	<i>(R-UCLA)</i>	<i>No other significant effects.</i>
	<i>Study attrition:</i>	<i>Mindfulness</i>	
	<i>15%</i>	<i>(CAMS-R10)</i>	<i>Dose response: Significant</i>
			<i>inverse correlation between</i>
	<i>Adherence:</i>	<i>Gratitude</i>	<i>total practice time and fear</i>
	<i>Mean</i>	<i>(GQ-6)</i>	<i>of recurrence measure</i>
	<i>attendance 7.33</i>		<i>severity and distress scales</i>
	<i>sessions</i>		<i>($\rho=-0.65$, 95% CI (-0.91, -</i>
			<i>0.03) and $\rho=-0.65$, 95% CI</i>
	<i>Mean total</i>		<i>(-0.91, -0.04) respectively).</i>
	<i>practice time:</i>		<i>P values not reported.</i>
	<i>738.5mins (SD</i>		
	<i>330.3)</i>		

Note: CAMS-10= Cognitive and Affective Mindfulness Scale- Revised; CARS= Concerns about Recurrence Scale; CBCT= Cognitively Based Compassion Training; CES-D= Center for Epidemiologic Studies – Depression; C-SOSI= Calgary Symptoms of Stress Inventory; FACIT= Functional Assessment of Chronic Illness Therapy; FCRI= Fear of Cancer Recurrence Inventory; FFMQ= Five Facet Mindfulness Questionnaire; FRQ= Fear of Recurrence Questionnaire; GQ-6= The Gratitude Questionnaire; HADS= Hospital Anxiety and Depression Scale; IES= Impact of Events Scale; LOT= Life Orientation Test; MAAS= Mindful Attention Awareness Scale; MAPS= Mindful Awareness Practices; MBCR = Mindfulness-based Cancer Recovery; MBSR= Mindfulness-based Stress Reduction; PANAS-PA= Positive and Negative Affect Schedule – Positive Affect; POMS= Profile of Mood States; PSOMS= Positive States of Mind Scale; PSS= Perceived Stress Scale; PTGI= Post Traumatic Growth Inventory; QLACS= Quality of Life in Adult Cancer Survivors; RRS= Rumination Response Scale; R-UCLA= Revised UCLA Loneliness Scale; SCS= Self-Compassion Scale; SET = Supportive Expressive Therapy; SMS= Stress Management Seminar; SOC= Sense of Coherence Scale; STAI= State-Trait Anxiety Inventory; WLC= Wait list control

Characteristics of Studies

Intervention Type

The majority of selected studies investigated the effectiveness of MBSR (n=5; 59, 61, 62, 64, 53) or MBCR (n=3; 56, 52, 65) interventions. From the information provided within reports, both intervention types largely followed the same general format and content, with only slight adaptations being made to the original standardised programs [21,23]. All but two courses were eight weeks in duration, with the two by Lengacher's group lasting only six weeks [62-63]. There was also slight variation within the length of classes. The majority of sessions lasted 2 hours, with the exception of Hoffman [61], where the first and last classes were 2.25 hours; Carlson [52] where all classes were 90 minutes; and Blaes [56] where classes were 2.5 hours. Only one of the MBSR studies contained an intensive mindfulness retreat [61], while all three MBCR classes included this feature [52, 56, 65].

The other three studies selected for review each investigated a different form of MBI. Bower and colleagues [57] investigated a Mindful Awareness Practice (MAPS) intervention, which was tailored for younger breast cancer survivors by the inclusion of information on health promotion and prevention of cancer recurrence.

The intervention was 6 weeks in duration with 2-hour long sessions, and covered comparable material to the standardised MBSR/MBCR programs including information about mindfulness and relaxation, experiential mindfulness-based exercises, psychoeducation, and group discussion around overcoming barriers to practice and managing difficult thoughts and emotions. Crane-Okada and colleagues [66] reported on a novel Mindful Movement intervention, which combined mindfulness training with dance/movement therapy to target increased body and mind awareness. Sessions took place over 12 weeks each lasting 2 hours, and involved both music and dance, mindful exercises, and group discussion around experiences and thoughts. In the third study, Dodds and colleagues [67] reported results from a Cognitively Based Compassion Therapy (CBCT) intervention with a sample of breast cancer patients. This intervention was 8 weeks in length, with 2 hourly classes. It incorporated experiential practical elements of mindfulness training with cognitive analysis of contributors to stress, with an emphasis on self-compassion.

All but one of the interventions [52] included in the review reported the inclusion of a homework element, incorporating experiential mindfulness exercises, reading, and reflective practice, with suggested duration of home practice ranging from 5 to 45 minutes, 3 to 7 days a week. Four studies reported the use of formal measures of intervention fidelity, which included independent observation [62-63], use of a structured checklist [66], and video recording of classes [67]. Most studies also recorded participant adherence to the intervention, through number of classes attended and diaries logging home practice. Calculation and direct comparison of adherence rates was not possible across studies however, due to inconsistencies in reporting of this information.

Design

Most of the studies employed a two-arm, single centre, randomised controlled design. Eight involved a wait-list control condition, whereby participants continued to receive usual follow up cancer care and were offered the intervention on study

completion [56-59, 61-65, 67]. One employed a non-wait list 'treatment as usual' control group, who were offered a one off 3-hour intervention on study completion [66]. Only one study was multicentre [52], recruiting from similar settings across two major cities in Canada. Among the studies included in this review, only two encompassed an active control arm. Carlson *et al* [52] employed a three-arm design comparing MBSR with SET and a minimal treatment control group (Stress Management), while Sarenmalm *et al* [53] also compared three conditions of group + self-instructing MBSR, self-instruction only MBSR, and usual care control.

Sample Characteristics

The vast majority of participants recruited to selected studies were breast cancer survivors. Eight studies were aimed at only breast cancer patients, while breast cancer was the most prevalent diagnosis in the three mixed cancer studies. There was inconsistency in reporting of the length of time since cancer treatments had been completed. Only three studies reported data on this variable [61-62, 64]. Four further studies specified a range of time points within their eligibility criteria but did not provide data on means (Blaes *et al* – within 6 months [56]; Carlson *et al* - at least 3 months [52]; Zernicke *et al* - within 3 years [65]; Crane-Okada *et al* - more than 12 months [66]). Time since diagnosis was reported for 6 studies, and ranged from less than one year to 10 years, with most participants being within the first 5 years since diagnosis.

Most studies reported information on cancer stage, with the majority including patients with stage 0-III disease only. Three did not report information on cancer staging [53, 56, 59], and two studies included some participants with stage IV cancer [65,67]. One study also reported some participants to have received their latest cancer treatment in relation to a recurrent cancer [61]. All but 3 studies [52,59,65] reported details of the nature of cancer treatments received by participants. The majority of participants included had received surgery, chemotherapy treatment, and radiotherapy treatment. Of the studies reporting detail of hormonal cancer

treatments [53, 57, 61, 64, 67], roughly half of the sample in each case had received such treatment.

Only two studies screened potential participants for distress, in order that only individuals experiencing at least moderate levels of distress were included [52, 65]. Both studies utilised the Distress Thermometer [68] screening tool, specifying a cut-off of four or higher to indicate eligibility for study entry. While this is a commonly used clinical cut-off, some have suggested that a score of six or seven might be more appropriate for its use as a single screen measure to identify distressed cancer patients [69].

Participants were recruited to studies from a variety of settings, using a range of methods. These included; media adverts and publicity within local newspapers or webpages [59, 52, 65, 66, 67]; cancer centres [52, 53, 56, 62, 64, 66, 67]; general healthcare centres [62, 64]; community outreach [52, 65]; and third sector support services and cancer patient organisations [61, 59, 66]. Some studies also used direct invitation methods, including; inviting potentially eligible participants from existing pools of research participants [57, 67]; physician referrals [57]; and direct mailing to potentially eligible participants via cancer registries [52, 65]. For studies recruiting from within clinical settings, there was insufficient information to establish whether the sample were purely self-selected or screened and notified of the study in some way. For studies employing a range of recruitment methods, there was no indication as to the relative numbers recruited via each method or setting to allow comparison of findings between groups. In three studies, participants were incentivised to participate with monetary or food voucher payments [62, 66, 67].

Sample Size & Power

The sample size of selected studies was variable, ranging from 33 to 322, with a total of 1,411 participants included across studies. Seven studies had small to moderate sample sizes of <100 [56-57, 59, 62, 65-67], while four had large sample sizes of >150 [52, 53, 61, 64]. All but one study [66] conducted an a priori sample size calculation,

and eight were sufficiently powered when accounting for final attrition rates [52-53, 57, 61-62, 64- 65, 67].

Attrition & Acceptability

Study attrition rates were generally low. Four studies had attrition rates of >20%, although two of these were only marginally higher at 21% [56] and 20.4% [66]. However, six studies reported substantial differences in attrition rates between the intervention and control conditions, with a larger proportion of participants dropping out from the intervention arm than the control arm in all cases. This was generally not addressed by the study reports. Reasons for study drop out were only reported by a minority of studies and included: disease progression; other illness / health reasons; schedule conflicts; intervention not what was expected; being too busy; work; not wanting to be with other cancer patients; and moving away. Additionally, studies differed in how they defined successful completion of the intervention (e.g. minimum number of sessions attended), making rates of completion difficult to compare across studies. These issues limit the conclusions which can be drawn about the acceptability of the interventions to participants. Only two studies directly assessed participant satisfaction [65, 67], both reporting very high levels of satisfaction.

Main Negative Psychological Outcome Measures

Disturbed Mood & Stress:

All selected studies included a measure of mood disturbance or distress, and there was relative homogeneity in the self-report measures utilised to assess this outcome. Three studies [52, 61, 65] used an overall measure of mood disturbance, the Profile of Mood States (POMS) [70]. The 65-item measure produces scores on six dimensions of anxiety; depression; anger; vigour; fatigue; and confusion, as well as a Total Mood Disturbance (TMD) score, produced by summing all dimension scores. Lower scores indicate less mood disturbance. All three studies used the TMD score in their analyses. The scale has been widely used within medical populations, including cancer patients [71], however has been noted to be a relatively lengthy

measure, which may be burdensome for completion within medical settings. A briefer short form has been developed which has been shown to have comparable psychometric properties to the original scale [72] however all three studies used the original measure.

Three studies used the Hospital Anxiety and Depression Scale (HADS) [74] to measure symptoms of anxiety and depression independently [53, 59, 66]. This 14 item questionnaire measures symptoms of anxiety and depression and was specifically developed for use within populations with physical illness. It contains 7 items for anxiety and 7 for depression, each scored from 0 to 3, with a possible maximum score of 21 and total scale score of 42 for overall psychological distress. Higher scores indicate higher levels of anxiety, depression, and distress. The HADS is widely used in research and clinical practice, and has been shown to have good internal consistency and concurrent validity [75].

Anxiety was measured using the State Trait Anxiety Inventory (STAI) [76] in three studies [56, 62, 64]. This measure assesses both current (state) and general long term (trait) anxiety levels using two subscales each containing 20 items, with higher scores indicating higher levels of anxiety. It is widely used in clinical research and has been shown to have good psychometric properties [77]. One study [62] utilised both subscale scores, while the others utilised only the State-Subscale [56,64].

Depressive symptoms were measured using the Center for Epidemiological Studies – Depression Scale (CES-D) [78] in four studies [57, 62, 64, 67]. This 20-item measure assesses frequency of depressive symptoms within the past 7 days, with higher scores indicating greater depressive symptomology. It has been validated and shown to be a valid and reliable measure of depressive symptoms within cancer populations [79].

The majority of studies also included a measure of stress, and this outcome was most widely assessed using the Perceived Stress Scale (PSS) [80]. This is a ten-item scale which measures individuals' perceptions of stressful life situations over the previous month, with higher scores indicating of higher levels of stress. The scale

has been widely applied in research including in cancer populations, and has good psychometric properties [81]. Four studies in the current review used the original 10 item measure [57, 59, 62, 64], while one study used the briefer four item version of the scale (PSS-4; [80]) [67].

Another measure of stress, used by two studies [52, 65], was the Calgary Symptoms of Stress Inventory (CSOSI) [82]. This measure contains 56 items measuring behavioural, psychological and physical responses to stressful situations. Subscales are combined to give a total stress score, with higher scores indicating increased levels of stress. It has been validated within cancer populations and found to have satisfactory internal consistency and good predictive validity [82].

Risk of Bias & Quality of Studies

Full quality criteria ratings for all studies can be found in *Appendix 3*, and are summarised in *Table 3a*. The quality of included studies was mixed. The overall quality rating of three studies was high [61, 64, 67], while four others were of acceptable quality [52, 57, 62, 65]. The remaining four papers were rated as low quality [53, 56, 59, 66]. Selection bias around the randomisation procedure used was generally well addressed, with most studies using a computer-generated randomisation sequence. Allocation concealment on the other hand was poorly addressed. Only five studies reported adequate allocation concealment procedures, with the remaining studies not addressing concealment in their report. As the included studies were all of group psychological interventions, full blinding of participants and researchers to reduce performance bias was not possible. However, three studies did address detection bias either by tasking a research assistant independent from the intervention delivery with collection of all outcome data [61], or by using online data collection methods [65, 67]. Of note, two of the papers scored as 'unable to say' in the risk of detection bias criterion reported blinding of outcome collection at baseline, but did not report any such details for post intervention. Therapist fidelity was also poorly addressed across studies, with seven papers not reporting any formal fidelity measures.

+ Well Addressed - Poorly Addressed ? Unable to say	Randomisation (selection bias)	Allocation concealment (selection bias)	Blinding (detection bias)	Missing data (Attrition bias)	Data Handling (Attrition bias)	Selective reporting (Reporting bias)	Group similarity baseline	Study power	Therapist training	Therapist fidelity	Adherence measures	Overall Study Quality Rating ++ High + Acceptable 0 Low
<i>Blaes et al</i>	+	?	?	-	-	-	+	-	+	?	+	0
<i>Bower et al & Boyle et al</i>	?	+	?	+	+	+	+	+	+	?	+	+
<i>Branstrom et al</i>	+	?	-	-	+	+	+	-	-	?	+	0
<i>Carlson et al</i>	+	+	?	-	+	+	+	+	+	?	?	+
<i>Hoffman et al</i>	+	+	+	-	+	+	+	+	+	?	+	++
<i>Lengacher et al (2009)</i>	+	?	?	+	+	+	?	+	+	+	+	+
<i>Lengacher et al (2016)</i>	+	?	?	+	+	+	+	+	+	+	+	++
<i>Zernicke et al</i>	+	?	+	-	+	+	+	+	+	?	+	+
<i>Sarenmalm et al</i>	+	+	?	-	-	+	+	+	+	?	?	0























<i>Crane-Okada et al</i>												0
<i>Dodds et al</i>												++

Table 3a. Summary table of quality criteria ratings for reviewed studies

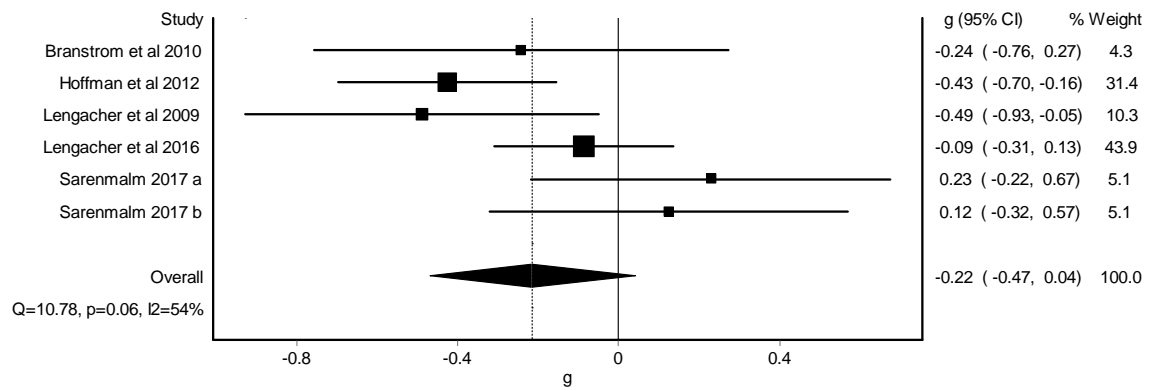
Key Findings

Meta-Analysis of MBSR & MBCR Studies

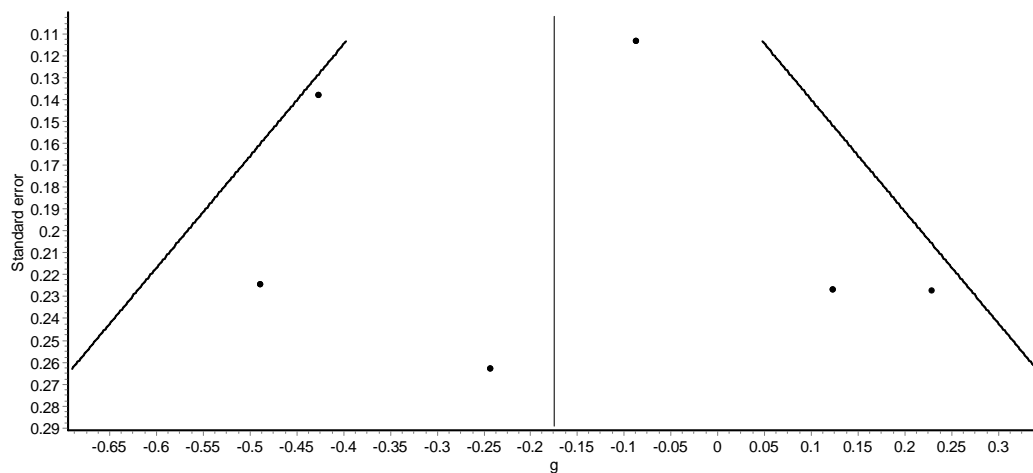
Although the search strategy employed aimed to review a range of mindfulness-based intervention approaches within cancer survivor populations, eight out of the eleven studies selected for review were of standardised MBSR or MBCR interventions. There were insufficient numbers of other types of intervention to allow for a subgroup analysis by intervention type. Therefore, only the eight MBSR and MBCR studies were subject to meta-analyses, to ensure inclusion only of studies with sufficient similarity to allow pooled effect sizes to be calculated. From the eight studies, data on anxiety, depression, and perceived stress were extracted and used in the analyses. The other outcomes of interest (total mood disturbance, cancer specific distress/post-traumatic symptoms, and fear of recurrence) were insufficient in number or too heterogeneous in their measurement to allow them to be meaningfully included in the quantitative synthesis of findings.

Results of the meta-analysis for anxiety outcomes, involving data from 833 participants across 5 studies, revealed a small, non-significant pooled intervention effect size of -0.22 (95% CI -0.47, 0.04). The negative direction of the effect size indicates effects on anxiety in favour of the MBIs relative to controls. Indications of heterogeneity between studies were moderate, as demonstrated by a significant Cochran's Q statistic ($Q=10.78$, $p<0.10$) and I^2 statistic of 54%. Sensitivity analysis revealed that two studies, Sarenmalm (a and b) [53] and Hoffman [61] were contributing to the significant heterogeneity, with the I^2 reducing to 37% when each study was removed, and 24% when both were removed.

Figure2a. Forest and Funnel Plots for Anxiety effects

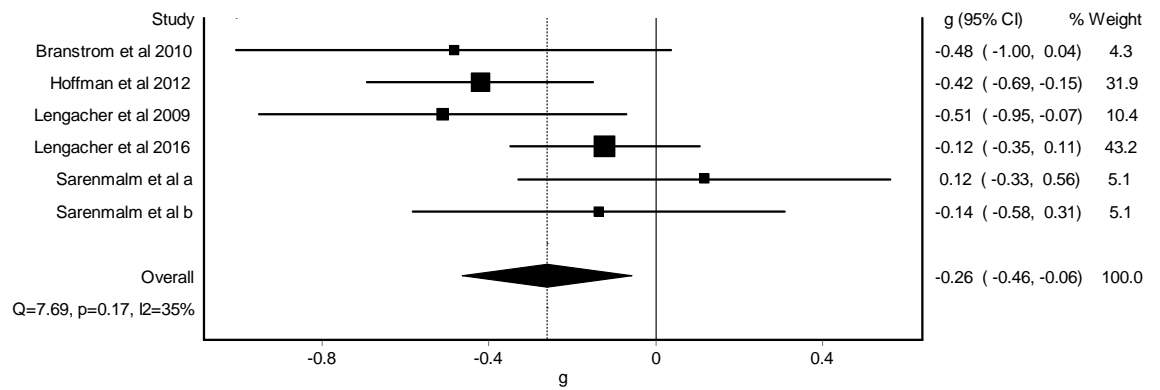


Note: Sarenmalm a= MBSR vs active control (self-instructing MBSR); Sarenmalm b= MBSR vs non-active control (no MBSR)

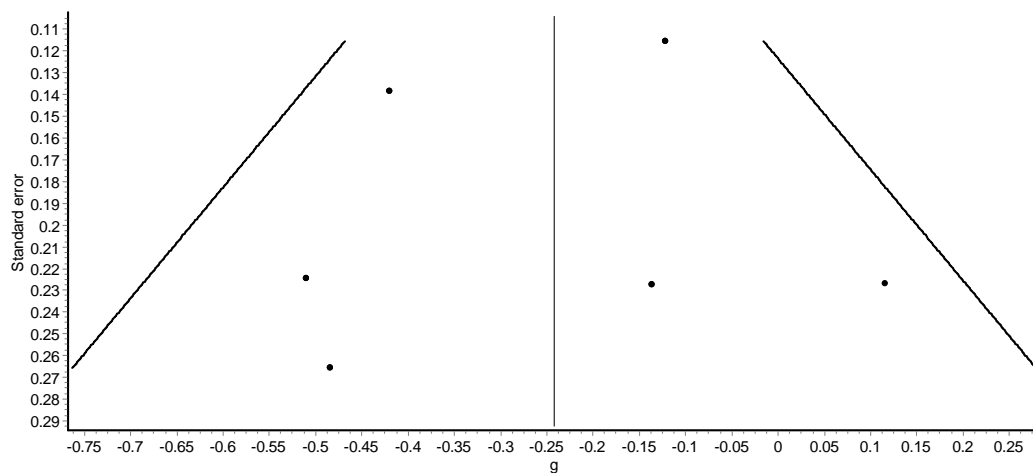


Results for the analysis of depression data, involving 822 participants across 5 studies, revealed a small but significant pooled intervention effect size of -0.26 (-0.46, -0.06). Again, the minus effect size denotes an effect in favour of the MBI condition. In relation to this outcome, heterogeneity between studies was found to be insignificant ($I^2=35\%$; $Q=7.69$, $p=0.17$ ns), suggesting that effect sizes were all measuring similar effects. This suggests that overall the MBSR/MBCR interventions had a small beneficial decrease in depressive symptoms compared to control groups.

Figure 3a. Forest and Funnel plots of effects for Depression

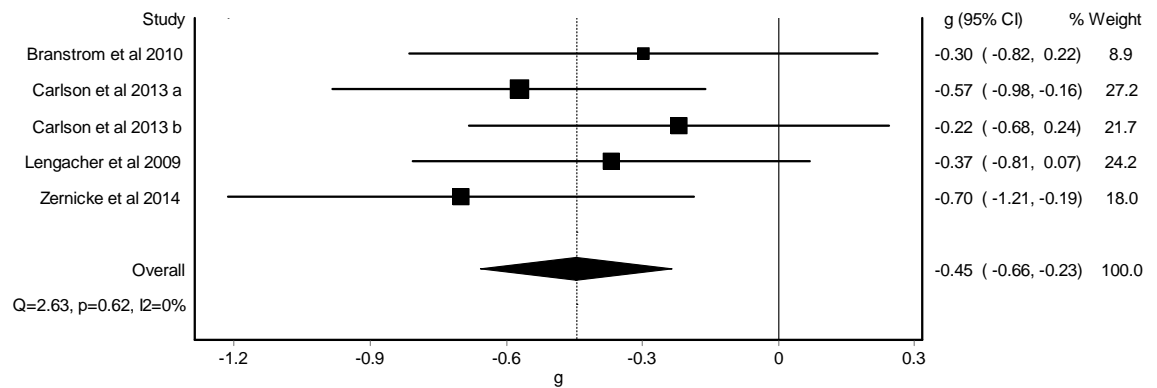


Note: Sarenmalm a= MBSR vs active control (self-instructing MBSR); Sarenmalm b= MBSR vs non-active control (no MBSR)

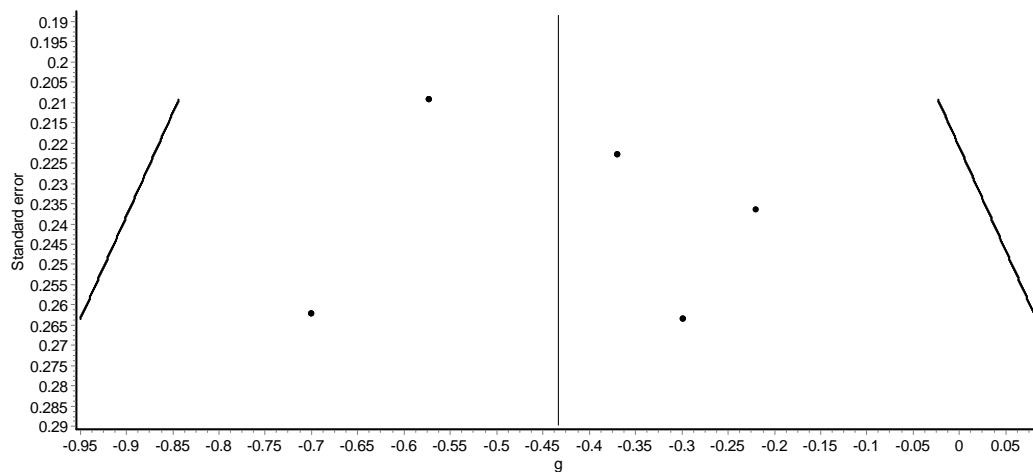


Analysis of data from 384 participants across 4 studies revealed a small to moderate significant pooled intervention effect size for perceived stress (-0.45 (-0.66, -0.23)). The direction of the effect is again in favour of increased benefits of MBI relative to control. Levels of heterogeneity between studies for perceived stress outcomes were very low ($Q=2.63$, $p=0.62$ ns; $I^2=0\%$). These findings indicate that of the three outcomes included in the meta-analysis, MBSR/MBCR had the most beneficial impact on cancer survivors' perceived stress levels comparative to control groups.

Figure 4a. Forest plot of effects for Perceived Stress



Note: Carlson a= MBCR vs SET (active control); Carlson b= MBCR vs SM (non-active control)



Visual inspection of funnel plots for all three meta-analyses revealed approximately symmetrical distribution of effect sizes, suggesting low probability of publication bias.

Narrative Synthesis of Additional Findings

Dose Response Effects

Six studies considered a possible dose response relationship between total mindfulness practice and psychological outcomes [56-57, 61, 62, 64, 67]. On balance, the evidence did not support the existence of such a relationship, with the three largest and better-quality studies failing to find a significant correlation between mindfulness practice time and outcomes of stress [57], depressive symptoms [57],

overall mood [61], or fear of recurrence [64]. Only the study by Dodds *et al* [67] reported a large correlation between practice time and reductions in severity and distress of fear of recurrence. Three studies did report significant but small dose-response relationships between practice time and reductions in anxiety [56] and perceived stress [62], however neither of these studies were of high methodological quality and both had relatively small sample sizes. Intriguingly, Lengacher *et al* [62] found an inverse relationship between practice time and optimism.

Fear of Cancer Recurrence & Cancer Specific Distress

The effect of the intervention on fears of cancer recurrence was addressed by five studies [57, 62, 64, 66-67]. Fear of recurrence has been identified as a common problem impacting on cancer survivors [83], however there is currently no agreed 'gold standard' measure. Consequently, four different tools for assessing fear of cancer recurrence were used by the studies. Bower *et al* [57] used the Assessing Quality of Life in Adult Cancer Survivors (QLACS) [84]. Two studies used the breast cancer specific Concerns about Recurrence scale (CARS; [85]) [62, 64]. Crane-Okada and colleagues [66] used the Fear of Recurrence Questionnaire [86]. Dodds *et al* [67] used the Fears of Cancer Recurrence Inventory (FCRI; [87]). Overall, findings suggested the mindfulness-based interventions to be effective in reducing fear of recurrence, with four out of the five studies finding significant effects [62, 64, 66-67]. Three of these studies were of acceptable or high quality [62, 64, 67].

Cancer specific distress, also conceptualised as intrusive thoughts about cancer were reported as an outcome by three studies, two of which used the Impact of Events Scale [88] to measure the construct [57, 59], and one used the Impact of Events Scale revised (DODDS IES-R; [89]). The evidence for the effectiveness of MBI's in reducing cancer specific distress appears mixed, with a high quality but small study by Dodds *et al* [67] and a moderate but low-quality study by Branstrom *et al* [59] reporting significant symptom reductions in this outcome. Meanwhile, Bower and colleagues [57] in their moderately sized study which was of acceptable quality found the intervention not to be effective in reducing post traumatic symptoms.

Positive Psychological Outcomes

In addition to the negative psychological outcomes outlined above, a number of studies also reported positive psychological outcomes. The most relevant of these measures to the current review was mindfulness, which was reported by seven studies. The most frequently used measure of mindfulness was the Five Factor Mindfulness Questionnaire (FFMQ; [90]) [57, 59, 65, 66, 53], with other measures including the Mindful Attention Awareness Scale (MAAS; [91]) [66], Self-Compassion Scale (SCS; 92) [66], and Cognitive and Affective Mindfulness Scale – Revised (CAMS-R10; [93]) [67]. Four studies looked at the effect of the intervention on pre-to post changes in mindfulness scores between groups [53, 65, 66, 67]. Findings were mixed, with a general trend of increases in mindfulness pre-to post intervention, however in one study some improvements in aspects of mindfulness were also observed in the control group [65]. Only one of these studies was of high methodological quality, indicating that caution should be taken in interpreting the strength of the evidence suggesting MBI's to improve mindfulness in this population. The other three studies conducted mediation analyses, to explore the role of changes in mindfulness in mediating the effect of the intervention [52, 58-59]. On balance, the evidence reviewed does not support the role of mindfulness in mediating the impact of the interventions. One study did report mindfulness to mediate effects on both reductions in perceived stress and cancer specific distress avoidance, and increases in positive states of mind, however this study was of low quality meaning this finding should be interpreted with caution [59]. Boyle *et al* [58] also found mindfulness to significantly mediate the effect of intervention on depression, however when considered among a range of mediating variables, self-compassion was found to be a more influential mediator. In contrast, Carlson and colleagues [52] found that mindfulness did not significantly increase from pre-to post intervention, and was therefore not involved in mediating the effect of the intervention on outcomes.

Of the other positive psychological outcomes, one large reasonable quality study found coping capacity and personal growth were significantly improved post MBSR

intervention relative to the control group [53]. Significant improvements were found pre-to post intervention in both positive affect and meaning and peace by [57], and significant increases in positive states of mind were reported by [59], however the sample sizes of these studies were relatively small and neither were of high quality. Based on three studies of reasonable or high quality, no significant intervention effects were found for post traumatic growth [65], gratitude [67], or optimism [62].

Discussion

Main Findings

Overall, the findings from this review offer tentative support for the effectiveness of mindfulness-based interventions in ameliorating levels of perceived stress and depressive symptoms in post treatment cancer survivors. They therefore provide some endorsement for the proposed relevance of mindfulness-based approaches for helping patient find ways of living well in the context of the difficult physical and emotional sequelae they may face following treatment for cancer. The most encouraging findings were for reductions in perceived stress, while the evidence for anxiety was less convincing.

Direct comparison of these findings with previous research is challenging due to the fact that many previous reviews have considered a range of different outcomes relating to psychological wellbeing. Of those specifically considering anxiety and depression however, the current review found smaller effect sizes for both outcomes than all previously published meta-analyses [25-26, 30-31], and a smaller intervention effect on stress outcomes [26]. The discrepant findings relative to existing reviews may in part be due to the small number of studies which met criteria for quantitative review. It may also be the case that inconsistency in findings reflects differences in the effectiveness of mindfulness-based interventions between patients with mixed treatment status and the specific post-treatment survivor

population. As the evidence base continues to grow, further review is recommended in order to elucidate this further.

When considering the significant heterogeneity found within the meta-analysis analysis for anxiety, a few possible explanations for clinical diversity between studies in the analysis can be hypothesised. Firstly, the Hoffman [61] study involved only patients attending a third sector service attended by individuals for psychological support. Participants in this study may therefore have simultaneously been more psychologically distressed and more open to and ready to receive intervention, and therefore less representative of the overall sample of cancer survivors. Indeed, Hoffman and colleagues noted in their report that baseline mood disturbance levels were more severe than those reported in normative data and previous studies [61]. Furthermore, it is noted that within this analysis Hoffman was the only study in which the inclusion of a one-day intensive mindfulness retreat was retained from the standardised program, therefore the increased level of mindfulness training input may have further led to this sample being less representative of the clinical population as a whole.

In relation to the Sarenmalm study, baseline anxiety scores were higher in the MBSR active intervention group than in both control groups [53]. Therefore, despite reductions in anxiety levels following the active intervention, mean scores remained proportionately higher relative to the control groups. Furthermore, the inclusion of an active control condition in the analyses introduces a comparison of a different nature, and therefore may introduce further heterogeneity, as the active control group consisted of a self-instructing MBSR group, which may be expected to experience more closely paralleled changes to the instructed group MBSR intervention. Finally, it is of note that compared to depression and stress outcomes, anxiety outcomes across all studies were measured with a wider variety of measures, which may also have increased overall heterogeneity. Further statistical exploration of heterogeneity was not possible using subgroup analysis or meta-

regression due to the small number of studies, and caution should therefore be taken when drawing conclusions from these results.

The current review also provides important information contributing to our understanding of the mechanisms by which MBI's bring about improved outcomes in this population. Analysis of process measures was carried out by more than half of studies, most considering the potential mediating role of mindfulness. The findings were mixed for this variable, with not all studies found mindfulness to increase following intervention. In the Boyle *et al* study [58], mindfulness was found to mediate the effect of the intervention on depressive symptoms, however when a more complex model of mediation was considered, self-compassion was found to be a more influential mediator. This highlights the need for research to explore alternative pathways through which such interventions lead to improved outcomes. Within general mental health settings, a systematic review of evidence exploring such mediating relationships found the strongest evidence for MBSR effects being mediated via cognitive and emotional reactivity, moderate evidence for mindfulness, rumination and worry, and preliminary evidence for psychological flexibility [94]. Within cancer populations, one study providing useful insight into this question has also been conducted by Lengacher's group [63], where they found support for a model in which MBSR led to reductions in fear of cancer recurrence, which mediated a range of psychological and physical health outcomes. In addition, a longitudinal dissertation study also with a cancer sample reported bi-directional mediating relationships whereby increased mindfulness and enhanced emotional regulation skills interacted to produce intervention effects on psychological outcomes [95]. Further exploration of potential mediating relationships will be key in shaping the development of MBI interventions targeted at specific cancer populations, through the identification of the key ingredients through which successful outcomes are achieved.

Assessment of the overall quality of studies identified by this review suggests some caution should be taken in the degree of confidence we can have in the findings.

Weakness in methodological procedures were observed, particularly around allocation concealment and blinding of outcome collection, increasing the potential risk of bias to findings. In addition, while overall study attrition was not problematic for the majority of studies, many reported significantly higher rates of attrition in the intervention group relative to the control group. Encouragingly, in most cases authors employed intention to treat statistical analysis intended to reduce the risk of bias, however it remains a potential additional source of bias to findings. Furthermore, only a few studies included a formal measure of fidelity to the intervention. It is therefore difficult to assess the exact nature and quality of intervention received by participants, and cannot be assumed that standardised MBSR and MBSR interventions were delivered in the same way across studies. On the other hand, it is also worth highlighting a number of areas of methodological strength identified across studies. The majority of studies were well powered, and randomisation procedures were well addressed and appeared successful based on the similarity of groups at baseline. Furthermore, measurement of participant adherence to the intervention, which has been previously highlighted as a neglected aspect of MBI studies [28] was found to be well addressed within the current review.

Additional Findings

A supplementary aim of the current review was to summarise the evidence for dose response relationships between mindfulness practice and psychological outcomes. Encouragingly, over half of the selected studies considered this as an outcome, however overall findings were mixed, with three studies finding no evidence of a significant dose response, and two finding only small correlations with amount of practice and reductions in anxiety [56] and perceived stress [62]. Neither of these findings were based on high quality evidence, however findings from Dodds and colleagues [67], which was rated as a high-quality study, did report large correlations between increased mindfulness practice and decreasing fear of recurrence. In view of the current pressures faced by clinical services, these mixed findings warrant further exploration, in order that evidence can inform the

development of efficient interventions which utilise the minimum intervention resource for the maximum patient benefit.

An additional supplementary aim of the review was to explore the previously somewhat neglected area of positive psychological outcomes. A shift in focus from simply looking for reductions in negative outcomes, towards exploring potential positive impacts achieved by therapeutic interventions may be beneficial, as the two have been suggested to be related but discrete concepts [59]. Overall, limited conclusions can be drawn from the current findings about the effect of MBI's for post-treatment cancer survivors on positive psychological outcomes, due to the significant variation in outcomes studied.

With the continued expansion of the evidence base for mindfulness-based therapies in cancer, it would be beneficial for future research to take a more harmonious approach to the selection of relevant positive psychological outcome measures, in order that increased comparison across studies is possible. However, before this happens in practice, decisions will be required by researchers around choosing the most relevant outcome measures of interest. While the overall focus of acceptance-based approaches is not on controlling or eliminating unpleasant internal experiences (such as anxiety or distressing thoughts) but rather to change the relationship an individual has with such experiences, it may be argued that a shift is required in the type of outcome measures traditionally employed to measure effective change (e.g. severity of depressive and anxiety symptoms). On the other hand, in order to establish the relative benefit of ACT based interventions over and above those which are widely used, such as CBT, it is important that comparisons are able to be made between the two approaches.

One potentially overlapping outcome, which has often been studied in both traditional psychological therapies and which is consistent with a wider focus than simply elimination of distress, is that of QOL. However, quality of life as a concept is often poorly defined as a research outcome, and studies within clinically unwell populations such as cancer have employed a vast array of assessment measures and

definitions of the concept, making synthesis findings extremely challenging. Further work is therefore required in this area to allow the effective synthesis of future research findings.

Limitations of Current Evidence & Areas for Future Research

It is important to note that despite the original intention of the current review to include a broad range of acceptance-based interventions, the majority of interventions selected for review were of MBSR and MBCR. This finding in itself provides important information about the current state of the literature on more recently developed acceptance-based approaches within cancer survivor populations, such as Acceptance and Commitment Therapy (ACT). Four studies of ACT interventions were retained for review at the full text stage, however none met final criteria, due to not utilising an RCT design [96-97], including cancer patients at different stages of treatment [98], or not being available in English [99]. Two of these studies were published in the last two years, suggesting a potential increase of interest in the application of ACT within this population. It is clearly too early to assess the evidence for the efficacy of such approach within post treatment survivor populations, however the encouraging findings of ACT studies in wider cancer samples (e.g. [96]) suggest the benefit of continued expansion of this research into survivorship.

Another issue which is pertinent to the current review is that of possible floor effects due to the failure of most studies to screen participants for problematic levels of distress. Only two of the studies within the current review utilised this approach, which is in keeping with previous findings that psychological interventions in cancer populations generally do not specifically target those with distress [100]. While there is clear evidence that people experience a range of concerns after treatment completion, and that some require support, many patients are resourceful at self-managing and finding solutions themselves [101]. It has therefore been suggested that psycho-oncology interventions should be targeted specifically at those experiencing significant difficulties [100]. However, in line with the shift away

from eliminating negative symptoms towards a focus of living well, it may also be argued that acceptance-based interventions in particular have a place in helping all cancer patients to achieve more fulfilling lives following treatment. From this standpoint, interventions which aim to facilitate positive adjustment to cancer and offer preventative strategies to maintain good quality of life are of value [102]. This is an issue which has yet to be resolved, and has important implications for the assessment of efficacy of such interventions. No subgroup analysis between studies which screened for distress vs those which did not was possible within the current review due to low numbers. However, evidence from a meta-analysis of psycho-oncology studies across all cancer stages identified that those recruiting only significantly depressed patients reported much larger effects on outcomes relative to those with no screen [11].

Selected studies included mostly recent cancer survivors, consistent with findings from other authors that psycho-oncology survivorship research tends to focus less on longer term survivors [5]. This limits the extent to which the current findings can be applied to longer term cancer survivor populations, and no conclusions can be drawn about at what point in the post treatment survivorship pathway it might be best to introduce MBIs. In addition, the majority of participants within the reviewed studies were female breast cancer patients, limiting the generalisability of the findings to males and those with other cancer types. This is an issue which has been highlighted by other researchers in the field (e.g. [96]). It is important for research to be expanded to other cancer types and across age range and gender, in order to increase our understanding of potential adaptations which may be required for different groups (e.g. number of sessions, adapted content, or different timing in cancer journey). Evidence for how interventions may need to be tailored in this way comes from additional analysis of the reviewed study by Zernicke and colleagues [103], who found that younger participants experienced increased improvements in some outcomes compared to older participants, while males experienced increased post-traumatic growth over time relative to women.

A potential methodological limitation of the studies selected within the current review is that most employed a wait list control design. While such designs are extremely common in psychological research and have ethical advantages over, for example, a no treatment or placebo intervention control group, they do not allow researchers to control for non-specific effects of active intervention. Reliance on this design may therefore exaggerate the apparent effectiveness of the intervention. An alternative design using a 'head to head' comparison, where the relative efficacy of the intervention of interest versus an existing, evidence based intervention is assessed, has significant merit [104]. However, such designs are likely to require increased resources and costs to set up and run and, perhaps for this reason, within the current review only one study used a three-arm design with both active control and alternative evidence based therapy conditions for comparison [52].

Limitations & Strengths of the Current Review

There are a number of potential limitations to the current review. Firstly, a quantitative synthesis of findings was undertaken in light of the high levels of similarity between selected studies. However, the numbers of studies available for meta-analysis was low, and findings may therefore be subject to a higher risk of Type 1 error [105]. Secondly, an element of publication bias was introduced by the fact that it was not possible to include non-English language papers. This led to the exclusion of one paper which may otherwise have been selected for review [99]. Thirdly, the review was limited to considering only the immediate benefits of interventions. It would be beneficial for further work to be done to allow conclusions to be made about how well the observed effects were maintained into longer term survivorship. Finally, it was out of the scope of the current review to consider physical and biological outcomes in relation to MBIs in this population. There is however a substantial body of evidence on this topic and with recent tentative evidence from general population and mixed cancer stage patients suggesting potential beneficial impacts of MBIs on immune recovery [106], this field warrants further investigation.

There are also a number of strengths to the current review to be highlighted. This is the first known systematic evaluation of the evidence base for mindfulness-based interventions within the specific population of post-treatment cancer survivors. As outlined earlier, the explicit exploration of interventions for this stage of cancer is merited in view of evidence to suggest the particular prevalence of difficulties at this stage in the clinical course of cancer [34]. In addition, the explicit focus of the current review on randomised controlled trials sought to increase the quality and reduce the risk of bias of evidence considered. The inclusion of information about dose response and exploration of process outcomes also provide useful insights into the potential mechanisms by which such interventions may be effective. Aside from the necessary exclusion of non-English language papers, the review is also strengthened by the thorough attempts made to identify unpublished literature. Finally, where many existing reviews of psychological interventions for cancer patients encompass a very broad range of therapeutic interventions (e.g. [7]), the current review may allow for a more precise exploration by specifically focussing on interventions with a core component of mindfulness. This approach reduces the risk that findings may be diluted by heterogeneity between studies. As the evidence base for mindfulness-based approaches continues to develop, it will hopefully be possible to refine this still further, considering the relative strength of the evidence for distinct therapies with both acceptance-based and traditional CBT based approaches.

Clinical Implications

The National Institute for Clinical Excellence (NICE) guidelines on supportive care in cancer highlight the need to assess and treat psychological distress [107], and suggest a four-tiered service structure offering appropriate interventions dependent on the level of support required. While reference is made to CBT and psychotherapy within these guidelines, there are currently no national evidence based recommendations for the use of specific therapeutic approaches within cancer populations. Within a Scottish context, Psycho-oncology interventions are minimally covered within the MATRIX [108]. Where international guidelines exist,

they suggest that there is currently insufficient evidence for the relative advantage of one therapeutic modality over another, and therefore recommend selection of approaches to be based on individual patient factors and resources [109]. This highlights the requirement for the systematic synthesis of available evidence, such as presented in the present review, to ensure that patients are offered interventions based on the best currently available evidence.

A key consideration in assessing the feasibility of mindfulness-based interventions for cancer survivor populations is the extent to which they are acceptable to patients themselves. Limited conclusions around acceptability can be drawn from the evidence reviewed. The two studies which formally assessed satisfaction both reported very high endorsement of the intervention [65, 67]. However, the finding that six studies reported substantially higher attrition rates within the intervention group points to the need for further exploration of potential barriers to engagement with mindfulness-based approaches. Only limited qualitative evidence of this nature exists [e.g. [110]], however within the UK, a study exploring the perceptions and potential barriers to mindfulness interventions is ongoing, and will provide important insights once complete [111].

While significant advances have been made in recent years in increasing access to psychological therapies in general [37], there remain challenges to scaling up and adapting successful interventions delivered in research trials into actual clinical practice. In particular, researchers have highlighted that time constraints, staff turnover, and reduced intervention fidelity can pose barriers to the success of translating effective psychosocial interventions into real world clinical settings [112]. Maintaining intervention fidelity also requires to be balanced with achieving realistically flexible approaches which can be tailored according to individual formulations and applied in busy resource-constrained clinical settings. It has been argued that transdiagnostic approaches are particularly suited to achieving such a balance however, as they provide more flexible delivery while retaining a structure

for measurement [113]. Acceptance-based MBI's which are largely transdiagnostic may therefore be more easily introduced than some other intervention approaches.

One potential avenue for increasing the reach of MBI's in this population is the use of media based delivery. The encouraging results reported by Zernicke and colleagues [65] in their online adaptation of an MBCR intervention may stimulate further work to explore media based platforms as an effective alternative to traditional face to face group delivery of this type of program. Smartphone technology offers further possibilities for expanding the reach of mindfulness-based interventions for cancer patients, and has been suggested to be acceptable and effective in a range of physical and mental health settings (Barker, unpublished doctoral thesis). Although large-scale rolling out of online or app based mindfulness-based therapies for cancer survivors would take considerable work and investment, it may offer possibilities for reaching a much larger proportion of the survivor population, who may otherwise be unable to access these interventions.

Summary and Conclusions

This review aimed to fill a notable gap in the literature by providing a comprehensive synthesis of existing evidence for mindfulness-based interventions in post-treatment cancer survivors. Overall, findings of the review suggest that mindfulness-based therapies such as MBSR and MBCR offer some benefit to this group of patients, particularly in reducing symptoms of stress, and to a lesser degree in reducing depressive symptoms. The review also highlights important directions in future research, particularly around further exploration of the pathways through which such interventions lead to change, and a shift towards greater consideration of positive psychological outcomes in future intervention trials. Methodological limitations to the selected studies were observed, and future studies would benefit from ensuring more thorough assessment of intervention fidelity and patient acceptability. Despite these shortcomings, the review suggests that the increasing application of mindfulness-based therapies has the potential to

offer a helpful approach to addressing the emotional impact of cancer for the growing numbers of patients living beyond the disease.

References for Systematic Review

1. Krebber AMH, Buffart LM, Kleijn G, Riepma IC, de Bree R, Leemans CR, et al. Prevalence of depression in cancer patients: a meta-analysis of diagnostic interviews and self-report instruments. *Psycho-oncology*. 2014; 23: 121-130.
2. Mehnert A, Bruhler E, Faller H, Hurter M, Keller M, Schulz H, et al. Four-Week Prevalence of Mental Disorders in Patients with Cancer Across Major Tumour Entities. 2014; 32(31): doi: 10.1200/JCO.2014.56.0086.
3. MacMillan Cancer Support. Worried sick: The emotional impact of cancer. April 2006.
4. Kingston T, Collier S, Hevey D, McCormick MM, Besani C, Cooney J, et al. Mindfulness-based cognitive therapy for psycho-oncology patients: an exploratory study. *Irish Journal of Psychological Medicine*. 2015; 32: 265-274. doi:10.1017/ipm.2014.81.
5. Mitchell AJ, Ferguson DW, Gill J, Paul J, Symonds P. Depression and anxiety in long-term cancer survivors compared with spouses and healthy controls: a systematic review and meta-analysis. *Lancet Oncology*. 2013; 14: 721-32. doi: dx.doi.org/10.1016/ S1470-2045(13)70244-4.
6. Mitchell AJ, Chan M, Bhatti H, Halton M, Grassi L, Johansen C, et al. Prevalence of depression, anxiety, and adjustment disorder in oncological, haematological, and palliative-care settings: a meta-analysis of 94 interview based studies. *Lancet Oncology*. 2011; 12: 160-74. doi:10.1016/S14702045(11)70002-X.
7. Matthews H, Grunfield EA, Turner A. The efficacy of interventions to improve psychosocial outcomes following surgical treatment for breast cancer: a systematic review and meta-analysis. 2015: 1-15. doi: 10.1002/pon.4199.

8. Parahoo K, McDonough S, McCaughan E, Noyes J, Semple C, Halstead EJ. Psychosocial interventions for men with prostate cancer: a Cochrane systematic review. *BJU Int.* 2015; 116: 174-183. doi:10.1111/bju.12989.
9. Newell SA, Sanson-Fisher RW, Savolainen NJ. For the NSW Cancer Council Cancer Education Research Program. Systematic Review of Psychological Therapies for Cancer Patients: Overview and Recommendations for Future Research. *Journal of the National Cancer Institute.* 2002; 94(8): 558-584.
10. Osborn RL, Demoncada AC, Feuerstein M. Psychosocial interventions for depression, anxiety and quality of life in cancer survivors: meta-analyses. *Int'l J. Psychiatry in Medicine.* 2006; 36(1): 13-34.
11. Faller H, Schuler M, Richard M, Heckl U, Weis J, Kuffner R. Effects of Psycho-Oncologic Interventions on Emotional Distress and Quality of Life in Adult Patients with Cancer: Systematic Review and Meta-Analysis. *Journal of Clinical Oncology.* 2013; 31(6): 782-793. doi: 10.1200/JCO.2011.40.8922.
12. Phillips JL, Currow DC. Cancer as a chronic disease. *Collegian.* 2010; 17(2): 47-50.
13. Rowland JH. Cancer Survivorship: Rethinking the Cancer Control Continuum. *Seminars in Oncology Nursing.* 2008; 24(3): 145-152.
14. Mehta RD, Roth AJ. Psychiatric Considerations in the Oncology Setting. CA: A Cancer Journal for Clinicians. 2015. doi: 10.3322/caac.21285.
15. Hayes SC, Luoma JB, Bond FW, Masuda A, Lillis J. Acceptance and Commitment Therapy: Model, processes and outcomes. *Behaviour Research and Therapy.* 2006; 44: 1-25.
16. Carlson LE. Mindfulness-based interventions for coping with cancer. *Ann. N. Y. Acad. Sci.* 2016; 1373: 5-12. doi: 10.1111/nyas.13029.
17. Kabat-Zinn J. Mindfulness-Based Interventions in Context: Past, Present and Future. *Clin Psychol Sci Prac.* 2003; 10: doi: 144-156. 10.1093/clipsy/bpg01.
18. Bishop SR, Lau M, Shaprio S, Carlson L, Anderson ND, Carmody J, et al. Mindfulness: A Proposed Operational Definition. *Clin Psychol Sci Prac.* 2004; 11: 230-241. doi: 10.1093/clipsy/bph077.

19. Hofman SG, Sawyer AT, Fang A, Asnaani A. Emotion dysregulation model of mood and anxiety disorders. *Depression and Anxiety*. 2012; 29: 409-416.
20. Khourey B, Lecomte T, Fortin G, Masse M, Therien P, Bouchard V, et al. Mindfulness-based therapy: A comprehensive meta-analysis. *Clinical Psychology Review*. 2013; 33: 763-771.
21. Kabat-Zinn J, Massion AO, Kristeller J, Peterson LG, Fletcher KE, Pbert L, et al. Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *Am J Psychiatry*. 1992;149(7):936–943.
22. Grossman P, Niemann L, Schmidt S, Walach H. Mindfulness-based stress reduction and health benefits. A meta-analysis. *Journal of Psychosomatic Research*. 2004; 57: 35-43. doi: 10.1016/S0022-3999(03)00573-7.
23. Carlson LE, Speca M, Segal Z. Mindfulness-based cancer recovery. A step-by-step MBSR approach to help you cope with treatment and reclaim your life. New Harbinger Publications. Oakland CA. 2010.
24. Matchim Y, Armer JM, Stewart BR. Mindfulness-Based Stress Reduction Among Breast Cancer Survivors: A Literature Review and Discussion. *Oncology Nursing Forum*. 2011; 38(2): E61-E71.
25. Cramer H, Lauche R, Paul A, Dobos G. Mindfulness-based stress reduction for breast cancer – a systematic review and met-analysis. *Curr Oncol*. 2012; 19(5): e343-e352.
26. Zainal NZ, Booth S, Huppert FA. The efficacy mindfulness-based stress reduction on mental health of breast cancer patients: a meta-analysis. *Psycho-oncology*. 2013; 22: 1457-1465. doi: 10.1002/pon.3171.
27. Shennan C, Payne S, Fenlon D. What is the evidence for the use of mindfulness-based interventions in cancer care? A review. *Psycho-oncology*. 2011; 20: 681-697. doi: 10.1002/pon.1819.
28. Ledesma D, Kumano H. Mindfulness-based stress reduction and cancer: a meta-analysis. *Psycho-oncology*. 2009; 18: 571-579. doi: 10.1002/pon.1400.

29. Musial F, Bussing A, Heusser P, Choi K-E, Ostermann T. Mindfulness-Based Stress Reduction for Integrative Cancer Care – a Summary of Evidence. *Forsch Komplementmed*. 2011; 18: 192-202. doi: 10.1159/000330714.
30. Piet J, Wurtzen H, Zachariae R. The Effect of Mindfulness-Based Therapy on Symptoms of Anxiety and Depression in Adult Cancer Patients and Survivors: A Systematic Review and Meta-Analysis. *Journal of Consulting Clinical Psychology*. 2012; 80(6): 1007-1020. doi: 10.1037/a0028329.
31. Zhang MF, Wen YS, Liu WY, Peng LF, Wu XD, Liu QW. Effectiveness of Mindfulness-based Therapy for Reducing Anxiety and Depression in Patients with Cancer. A Meta-Analysis. *Medicine*. 2015; 94(45). doi: 10.1097/MD.0000000000000897.
32. Turton P, Cooke H. Meeting the needs of people with cancer for support and self-management. *Contemporary Therapies in Nursing & Midwifery*. 2000; 6: 130-137.
33. Costanzo ES, Lutgendorf SK, Mattes ML, Trehan S, Robinson CB, Tewfik F, et al. Adjusting to life after treatment: distress and quality of life following treatment for breast cancer. *British Journal of Cancer*. 2007; 97: 1625-1631.
34. Stanton A L, Ganz PA, Rowland JH, Meyerowitz BE, Krupnick JL & Sears SR. Promoting Adjustment after Treatment for Cancer. *Cancer Supplement*. 2005; 104(11): 2609-2613.
35. Reynolds LM, Bissett IP, Porter D, Consedine NS. A Brief Mindfulness Intervention is Associated with Negative Outcomes in a Randomised Controlled Trial Among Chemotherapy Patients. *Mindfulness*. 2017. doi: 10.1007/s12671-017-0705-2.
36. Hansen NB, Lambert MJ, Forman EM. The Psychotherapy Dose-Response Effect and Its Implications for Treatment Delivery Services. *Clin Psychol Sci Prac*. 2002; 9: 329-343.
37. Bower P, Gilbody S. Stepped care in psychological therapies: access, effectiveness and efficiency. Narrative literature review. *The British Journal of Psychiatry*. 2005; 186(1): 11-17.

38. Rouleau CR, Garland SN, Carlson LE. The impact of mindfulness-based interventions on symptom burden, positive psychological outcomes, and biomarkers in cancer patients. *Cancer Management and Research*. 2015; 7: 121-131. doi:org/10.2147/CMAR.S64165.
39. Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*. 2015; 4(1). doi: org/10.1186/2046-4053-4-1.
40. Higgins JPT, Green S. *Cochrane Handbook for Systematic Reviews of Interventions*. The Cochrane Collaboration. Version 5.1.0. 2011. Accessed online at <http://handbook-5-1.cochrane.org/> on 10th February 2017.
41. Hewitt M, Greenfield S, Stovall E. *From Cancer Patient to Cancer Survivor. Lost in Transition*. Committee on Cancer Survivorship: Improving Cancer Care and Quality of Life National Cancer Policy Board. Institute of Medicine and National Research Council of the National Academies. The National Academic Press. Washington DC. 2006.
42. National Coalition for Cancer Survivorship.
<https://www.canceradvocacy.org/about-us/our-mission/>. Accessed 15th April 2017.
43. National Cancer Institute.
<https://www.cancer.gov/publications/dictionaries/cancer-terms?cdrid=445089>. Accessed 15th April 2017.
44. Hayes SC, Villatte M, Levin M, Hildebrandt M. Open, Aware and Active: Contextual Approaches as an Emerging Trend in the Behavioral and Cognitive Therapies. *Annu Rev Clin Psychol*. 2011; 7: 141-68. doi: 10.1146/annurev-clinpsy-032210-104449.
45. Higgins JPT, Altman DG, Gotzsche PC, Juni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ*. 2011; 343: d5928. doi: org/10.1136/bmj.d5928.

46. Scottish Intercollegiate Guidelines Network. SIGN 50. A guideline developer's handbook. Revised edition. 2011.
47. Jüni P, Altman DG, Egger M. Assessing the quality of randomised controlled trials. In *Systematic Reviews in Health Care: Meta-analysis in Context*, Egger M, Smith GD, Altman DG (eds.). BMJ Publishing Group: London, England, 2001; 87–108.
48. Barendregt JJ, Doi SA. MetaXL User Guide. EpiGear International Pty Ltd. Australia. 2011-2016.
49. Doi SA, Barendregt JJ, Khan S, Thalib L, Williams GM. Advances in the Meta-analysis of heterogeneous clinical trials II: The quality effects model. *Contemp Clin Trials* 2015, 45:123-129.
50. Borenstein M, Hedges LV, Higgins JPT, Rothstein HR. *Introduction to Meta-Analysis*. John Wiley & Sons Ltd. 2009.
51. Cohen J. The statistical power of abnormal-social psychological research: A review. *Journal of Abnormal and Social Psychology*. 1962; 65: 145-153.
52. Carlson LE, Doll R, Stephen J, Faris P, Tamawanga R, Drysdale et al. Randomized Controlled Trial of Mindfulness-Based Cancer Recovery Versus Supportive Expressive Therapy for Distressed Survivors of Breast Cancer (MINDSET). *Journal of Clinical Oncology*. 2013; 31(25): 3119-3127. doi: 10.1200/JCO.2012.47.5210.
53. Sarenmalm EK, Martensson LB, Andersson BA, Karlsson P, Bergh I. Mindfulness and its efficacy for psychological and biological responses in women with breast cancer. *Cancer Medicine*. 2017; 6(5): 1108-1122. doi: 10.1002/cam4.1052.
54. Higgins JPT, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ*. 2003; 327(7414): 557-560. doi: <https://doi.org/10.1136/bmj.327.7414.557>.
55. Egger M, Smith GD, Minder C. Bias in meta-analyses detected by a simple, graphical test. *BMJ*. 1997; 315: 629. doi: <https://doi.org/10.1136/bmj.315.7109.629>.

56. Blaes AH, Fenner D, Bachanova V, Torkelson C, Geller M, Haddad T, et al. Mindfulness-based cancer recovery in survivors recovering from chemotherapy and radiation. *The Journal of Community and Supportive Oncology*. 2016; 14(8): 351-358. doi: 10.12788/jcso.0244.
57. Bower JE, Crosswell AD, Stanton AL, Crespi CM, Winston D, Arevalo J, et al. Mindfulness Meditation for Younger Breast Cancer Survivors: A Randomized Controlled Trial. *Cancer*. 2015: 1231- 1240. doi: DOI: 10.1002/cncr.29194.
58. Boyle CC, Stanton AL, Ganz PA, Crespi CM, Bower JE. Improvements in Emotion Regulation Following Mindfulness Meditation: Effects on Depressive Symptoms and Perceived Stress in Younger Breast Cancer Survivors. *Journal of Consulting and Clinical Psychology*. 2017; 85(4): 397-402.
59. Branstrom R, Kvillemo P, Brandberg Y, Moskowitz JT. Self-report mindfulness as a Mediator of Psychological Well-being in a Stress Reduction intervention for Cancer Patients – A Randomized Study. *Ann behav med*. 2010; 39: 151-161. doi: 10.1007/s12160-010-9168-6.
60. Schellekens MPJ, Tamawanga R, Labelle LE, Specia M, Stephen J, Drysdale E, et al. Mindfulness-Based Cancer Recovery (MBCR) versus Supportive Expressive Group Therapy (SET) for distressed breast cancer survivors: evaluating mindfulness and social support as mediators. *J Behav Med*. 2017; 40: 414-422. doi: 10.1007/s10865-016-9799-6.
61. Hoffman CJ, Ersser SJ, Hopkinson JB, Nicholls PG, Harrington JE, Thomas PW. Effectiveness of Mindfulness-Based Stress Reduction in Mood, Breast- and Endocrine-Related Quality of Life, and Well-being in Stage 0 to III Breast Cancer: A Randomized, Controlled Trial. *Journal of Clinical Oncology*. 2012; 30(12): 1335-1342. doi: 10.1200/JCO.2010.34.0331.
62. Lengacher CA, Johnson-Mallard V, Post-White J, Moscso MS, Jacobson PB, Klein TW, et al. Randomized controlled trial of mindfulness-based stress

- reduction (MBSR) for survivors of breast cancer. *Psycho-oncology*. 2009; 18: 1261-1272. doi:10.1002/pon.152.
63. Lengacher CA, Shelton MM, Reich RR, Barta MK, Johnson-Mallard V, Moscoso MS, et al. Mindfulness-based stress reduction (MBSR(BC)) in breast cancer: evaluating fear of recurrence (FOR) as a mediator of psychological and physical symptoms in a randomized controlled trial (RCT). *J Behav Med*. 2014; 37: 185-195. doi: DOI 10.1007/s10865-012-9473-6.
 64. Lengacher CA, Reich RR, Paterson CL, Ramesar S, Park JY, Alinat C, et al. Examination of Broad Symptom Improvement Resulting from Mindfulness-Based Stress Reduction in Breast Cancer Survivors: A Randomized Controlled Trial. *Journal of Clinical Oncology*. 2016; 34(24): 2827-2835. doi: 10.1200/JCO.2015.65.7874.
 65. Zernicke KA, Campbell TS, Specia M, McCabe-Ruff K, Flowers S, Carlson LE. A Randomized Wait-List Controlled Trial of Feasibility and Efficacy of an Online Mindfulness-Based Cancer Recovery Program: The eTherapy for Cancer Applying Mindfulness Trial. *Psychosomatic Medicine*. 2014; 76: 257-267. 10.1097/PSY.0000000000000053.
 66. Crane-Okada R, Kiger H, Sugerman F, Uman GC, Shapiro SL, Wyman-McGinty W, Anderson NLR. Mindful Movement Program for Older Breast Cancer Survivors. A Pilot Study. *Cancer Nursing*. 2012; 35(4): E1-E13. doi: 10.1097/NCC.0b013e3182280f73.
 67. Dodds SE, Pace TWW, Bell ML, Fiero M, Negi LT, Raison CL, et al. Feasibility of Cognitively-Based Compassion Training for breast cancer survivors: a randomized, wait list controlled pilot study. *Support Care Cancer*. 2015; 23: 3599-3608. doi: 0.1097/NCC.0b013e3182280f73.
 68. National Comprehensive Cancer Network: NCCN Clinical Practice Guidelines in Oncology: NCCN Practice Guidelines for the Management of Psychosocial Distress.
http://www.nccn.org/professionals/physician_gls/f_guidelines.asp. Accessed on 5th May 2017.

69. Lambert SD, Pallant JF, Clover K, Britton B, King MT, Carter G. Using Rasch analysis to examine the distress thermometer's cut-off scores among a mixed group of patients with cancer. *Qual Life Res.* 2014; 23(8): 2257-65. doi: 10.2007/s11136-014-0673-0.
70. McNair DA, Lorr M, Droppelman LF. Profile of mood states. San Diego, CA. Educational and Industrial Testing Service. 1971.
71. Cassileith BR, Lusk EJ, Strouse TB, Miller DS, Brown LL, Cross PA. A psychological analysis of cancer patients and their next-of-kin. *Cancer.* 1985; 1(55): 72-6.
72. Curran SL, Andrykowski MA, Studts JL. Short Form of the Profile of Mood States (POMS-SF): Psychometric Information. *Psychological Assessment.* 1995; 7(1): 80-83.
73. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica.* 1983; 67(6): 361-370.
74. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica.* 1983; 67(6): 361-370.
75. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The Validity of the Hospital Anxiety and Depression Scale. An Updated Literature Review. *Journal of Psychosomatic Research.* 2002; 52(2): 69-77.
76. Spielberger CD, Gorsuch RL, Lushene RE. Manual for the State-trait Anxiety Inventory. Consulting Psychologists: Palo Alto, CA. 1983.
77. Spielberger CD, Vagg PR. Psychometric properties of the STAI: a reply to Ramanaiah, Franzen and Schill. *J Pers Assess.* 1984; 48: 95-97.
78. Radloff LS. The CES-D Scale. A Self-Report Depression Scale for Research in the General Population. *Applied Psychological Measurement.* 1977; 1(3): 385-401.
79. Hann D, Winter K, Jacobsen P. Measurement of depressive symptoms in cancer patients: evaluation of the Center for Epidemiological Studies Depression Scale (CES-D). *J Psychosom Res.* 1999; 46(5): 437-43.

80. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav.* 1983; 24(4): 385-396.
81. Roberti JW, Harrington LN, Storch EA. Further Psychometric Support for the 10-Item Version of the Perceived Stress Scale. *Journal of College Counselling.* 2006; 9(2): 135-147.
82. Carlson LE, Thomas BC. Development of the Calgary Symptoms of Stress Inventory (C-SOSI). *Int J Behav Med.* 2007; 14(4): 249-56.
83. Lebel S, Ozakinci G, Humphris G, Mutsaers B, Thewes B, Prins J, et al. From normal response to clinical problem: definition and clinical features of fear of cancer recurrence. *Support Care Cancer.* 2016; 24: 3265-3268. doi: 10.1007/s00520-016-3272-5.
84. Avis NE, Smith KW, McGraw S, Smith RG, Petronis VM, Carver CS. Assessing quality of life in adult cancer survivors (QLACS). *Qual Life Res.* 2005; 14(4): 1007-23.
85. Vickberg SM. The Concerns About Recurrence Scale (CARS): a systematic measure of women's fears about the possibility of breast cancer recurrence. *Ann Behav Med.* 2003; 25(1): 16-24.
86. Northouse LL. Mastectomy patients and the fear of cancer recurrence. *Cancer Nurs.* 1981; 4(3): 213-20.
87. Simard S, Savard J. Fear of Cancer Recurrence Inventory: Development and initial validation of a multidimensional measure of fear of cancer recurrence. *Support Care Cancer.* 2009; 17: 241-251. doi: 10.1007/s00520-008-0444-y.
88. Sundin EC, Horowitz MJ. Impact of Events Scale: Psychometric Properties. *Br J Psychiatry.* 2002; 180: 205-209.
89. Weiss DS, Marmar CR. The impact of events scale-revised. In: Wilson J, Keane TM (Eds). *Assessing psychological trauma and PTSD.* Guildford, New York, pp. 399-411. 1996.
90. Baer RA, Smith GT, Hopkins J, Krietemeyer J, Toney L. Using self-report assessment methods to explore facets of mindfulness. *Assessment.* 2006; 13: 27-45.

91. Brown KW, Ryan RM. The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*. 2003; 84: 822-848.
92. Neff KD. Development and validation of a scale to measure self-compassion. *Self and Identity*. 2003; 2: 223-250.
93. Feldman G, Hayes A, Kumar S, Greeson J, Laurenceau JP. Mindfulness and emotion regulation: the development and initial validation of the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R). *J Psychopathol Behav Asses*. 2007; 29: 177-190.
94. Gu J, Strauss C, Bond R, Cavanagh K. How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clin Psychol Rev*. 2015; 37: 1-12. doi: 10.1016/j.cpr.2015.01.006.
95. Labelle LE. How does mindfulness-based stress reduction (MBSR) improve psychological functioning in cancer patients? Doctoral thesis. University of Calgary, Calgary, Alberta, Canada. 2012.
96. Arch JJ, Mitchell JL. An Acceptance and Commitment Therapy (ACT) group intervention for cancer survivors experiencing anxiety at re-entry. *Psycho-oncology*. 2016; 25: 610-615. doi: 10.1002/pon.3890.
97. Montesinos F, Luciano C. Acceptance of Relapse Fears in Breast Cancer Patients: Effects of an ACT-Based Abridged Intervention. *Psicooncologia*. 2016; 13(1): 7-21.
98. Abad ANS, Bakhtiari M, Kashani FL, Habibi M. The Comparison of Effectiveness of Treatment Based on Acceptance and Commitment with Cognitive-Behavioral Therapy in Reduction of Stress and Anxiety in Cancer Patients. *International Journal of Cancer Research and Prevention*. 2016; 9(3)229-246.
99. Paez MB, Luciano C, Gutierrez YO. Tratamiento Psicologico para el afrontamiento del cancer de mama. Estudio comparativo entre estrategias de aceptacion y de control cognitivo. *Psicooncologia*. 2007; 4(1): 75-95.

100. Richardson A, Addington-Hall J, Amir Z, Foster C, Stark D, Armes J, et al. Knowledge, ignorance and priorities for research in key areas of cancer survivorship: findings from a scoping review. *British Journal of Cancer*. 2011; 105: S82-S94. doi: 10.1007/s00520-008-0444-y.
101. Foster C, Breckons M, Cotterell P, Barbosa L, Calman J, Corner D, et al. Cancer survivors' self-efficacy to self-manage in the year following primary treatment. *Journal of Cancer Survivorship*. 2015; 9(1): 11-19.
102. Hunter CM, Kessler CL, Kessler R (Eds). *Handbook of Clinical Psychology in Medical Settings. Evidence-Based Assessment and Intervention*. Springer Science + Business Media. New York. 2014.
103. Zernicke KA, Campbell TS, Specia M, McCabe-Ruff K, Flowers S, Tamawanga R, et al. The eCALM Trial: eTherapy for Cancer Applying Mindfulness. Exploratory Analyses of the Associations Between Online Mindfulness-Based Cancer Recovery Participation and Changes in Mood, Stress Symptoms, Mindfulness, Posttraumatic Growth, and Spirituality. *Mindfulness*. 2016; 7: 1071-1081. doi: 10.1007/s12671-016-0141.
104. Karlsson P, Bergmark A. Compared with what? An analysis of control-group types in Cochrane and Campbell reviews of psychosocial treatment efficacy with substance use disorders. *Addiction*. 2015; 110(3): 420-8. doi: 10.1111/add.12799.
105. Field A. *Discovering Statistics Using IBM SPSS Statistics*. 4th Edition. Sage Publications. London. 2013.
106. Sanada K, Diez MA, Valero MS, Perez-Yus MC, Demarzo MMP, Montero-Marin J, et al. Effects of mindfulness-based interventions on biomarkers in healthy and cancer populations: a systematic review. *BMC Complementary and Alternative Medicine*. 2017; 17: 125. doi: 10.1186/s12906-017-1638-y.
107. National Institute for Clinical Excellence (NICE). Improving supportive and palliative care for adults with cancer: Cancer service guideline [CSG4]. March 2004.

108. The Scottish Government. A guide to delivering evidence based psychological therapies in Scotland: "The Matrix". 2015.
109. Li M, Kennedy EB, Byrne N, Gerin-Lajoie C, Green E, Katz MR, et al. The management of depression in patients with cancer. Toronto (ON): Cancer Care Ontario; 2015. Program in Evidence-based Care Guideline No.: 19-4.
110. Lehto RH, Wyatt G. Perceptions about using Mindfulness Therapy. *Cancer Nursing*. 2013; 36(4): E51-E60. doi: 10.1097/NCC.0b013e31826d2f16.
111. Eyles CG. Research project: MABcan Understanding and perceptions of mindfulness-based interventions and development of an adapted mindfulness intervention for breast cancer patients. University of Southampton. 2017.
https://www.southampton.ac.uk/medicine/academic_units/projects/mabcan.page. Accessed 5th June 2017.
112. Breen S, Schofi P, Aranda S, Development of nurse training programs for psychosocial interventions: Differences between the research and clinical environments. *Asia-Pac J Clin Oncol* 2012; 8(Suppl. 3): 116–217.
113. McHugh RK, Murray HW, Barlow DH. Balancing Fidelity and Adaptation in the Dissemination of Empirically-Supported Treatments: The Promise of Transdiagnostic Interventions. *Behav Res Ther*. 2009;47(11): 946-953.

Chapter 2: Empirical Study

Exploring the Impact of Psychological Flexibility on the Relationship between Fear of Cancer Recurrence and Adjustment in Cancer Survivors

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Empirical study written in accordance with author guidelines for *The Journal of Cancer Survivorship* (Appendix 6)

Abstract

Purpose

Evidence suggests that for people living with and beyond cancer, there are key time points in the trajectory at which psychological distress is most likely to occur. One such point is the transition from completion of treatment into survivorship, when fear of cancer recurrence (FOR) has been repeatedly identified as an unmet need for many. Consensus over the theoretical conceptualisation and measurement of FOR is only beginning to emerge, and limited interventions to reduce its impact have been tested. The current study aimed to explore the potential role of psychological flexibility, the underlying construct within Acceptance and Commitment Therapy (ACT), in mediating the relationship between severity of FOR and distress and quality of life (QOL) outcomes.

Methods

The study employed a cross-sectional questionnaire design. 75 post-treatment cancer survivors were recruited via cancer support centres, and completed a battery of assessment measures online or on paper. Relationships between predictor variables of FOR and psychological flexibility, and outcome variables of distress and QOL were explored, using multiple linear regression and Conditional Process Analysis.

Results

Findings showed that the severity of FOR was predictive of adjustment outcomes. While psychological flexibility as an overall construct did not significantly mediate these relationships, two processes within this framework, fusion to thoughts and valued living, were found to play a key role. Valued living had the strongest predictor of QOL and depression, while fusion with thoughts was most predictive of levels of anxiety.

Conclusions

Results point to the potential importance of understanding how individuals relate to their FOR in both in the identification of patients at risk of poorer adjustment, and

in guiding the development of interventions to reduce the impact of FOR. Further research using larger samples and longitudinal designs to replicate and expand this work is recommended. In particular, it will be important to consider the relative role of all of the processes conceptualised within psychological flexibility model.

Implications for Cancer Survivors

This study offers important insights into the key role of how individuals relate to FOR in mediating their impact, offering a potentially beneficial route for addressing currently unmet patient needs.

Keywords: Fear of recurrence; cancer survivorship, psychological flexibility, mediation model.

Introduction

Cancer survivorship context

With an ageing population and advances in screening and medical treatments, significantly more people are living with and beyond cancer. Survival rates have doubled in the last 40 years, with 50% of adults diagnosed with the disease now predicted to survive for at least 10 years [1]. Survival of course is not the only outcome of interest, and many survivors are troubled by late physical and psychological effects of treatment [2].

Clinical anecdote and research evidence have suggested that there are distinct points in the trajectory where patients often experience psychological difficulties. Diagnosis, end of treatment, and diagnosis of recurrence have been identified as critical points of potential vulnerability for psychological distress [3-5]. It has been suggested that patients often function on a 'basic physiological level', putting emotions to one side in order to get through treatment [6]. Consequently, it is often only once treatment is completed that difficult emotions can come to the fore.

Furthermore, during treatment, cancer patients are often told to expect symptoms to reduce or remit once treatment is completed, however this may not be the case for many individuals [7]. Stanton and colleagues [8] identified a number of unhelpful expectations or 'myths' that cancer patients may hold about completing treatment; such as 'I should be celebrating'; 'I should feel well'; 'I should be the pre-cancer me'; and 'I should not need support'. It has been suggested that psychological distress occurs when difficulties are experienced which are in contrast to patients own and family/friends' expectations about returning to 'normal' [8].

In recent years there has been increasing focus on the transition from active treatment into survivorship. This has been reflected in developments in international health policy, such as 'Cancer Patient to Cancer Survivor: Lost in Transition' in the USA [9], and more locally the 'Transforming Care after Cancer

Treatment' (TCAT) initiative [10]. Within the UK, current policy states that all patients should undergo psychological assessment at key points in their cancer pathway and have access to appropriate psychological support services where needed [11]. To successfully achieve this, it is crucial that research is carried out to establish which interventions are most effective for who and at which points in the cancer trajectory. In addition to improving patient care, there are important financial implications for delivering interventions at the point at which patients are about to leave routine hospital care, in terms of potential reductions in service use by preventing the escalation of psychological distress.

Fear of cancer recurrence

A small but increasing body of evidence has described common concerns reported during the transition to survivorship [12, 4, 8]. A common concern reported by patients at this point in their cancer journey is *fear of recurrence* (FOR), which can be defined as 'Fear, worry, or concern relating to the possibility that cancer will come back or progress' [13]. A degree of worry about the possibility of cancer returning following treatment is extremely common, and is an understandable, rational response to the life-threatening nature of the disease [14]. Indeed, a certain level of FOR is arguably helpful in motivating individuals to be vigilant for any signs of the cancer returning, in order that they receive medical intervention quickly. However, for some individuals, experiencing high levels of FOR has been associated with increased psychological morbidity, particularly in the months following completion of treatment [15], and has also been related to the exacerbation or development of psychiatric diagnoses such as Post Traumatic Stress Disorder and Generalised Anxiety Disorder [2]. In this context, it is unsurprising that FOR has also been shown to predict poor quality of life (QOL) [16]. It has also been shown to persist long after the completion of treatment, even when the risk of recurrence is statistically low [17]. Importantly, cancer survivors themselves have identified FOR

as the most common concern one year following treatment [12], and have indicated a desire for interventions to assist them in coping with uncertainty and FOR [6].

A handful of qualitative studies have offered insights into the lived experience of FOR [18-20]. Patients in these studies described a process of constructing a 'new normal' after treatment as they managed an uncertain future and fears of the cancer returning. Some remarked on the loss of no longer attending hospital, which had previously provided a source of active coping, allowing access to medical reassurance and social support. Strategies patients reported for coping with these fears included attempting not to think about possible recurrence; trying to focus on the positive; and pushing distressing thoughts and memories of treatment to the back of their mind. However, for many patients these fears often intruded into consciousness as nightmares and flashbacks. While this research is based mainly on female breast and gynaecological cancer patients, limiting its generalizability to survivors of other cancers, it highlights FOR as a key concern faced by patients during the transition to survivorship, and attempts to avoid experiencing such fears as a common but often unhelpful coping strategy.

There is a small body of evidence pointing to risk factors predicting which patients are most troubled by FOR. Three reviews have reported younger age; physical symptoms; low optimism; avoidant coping; poor QOL; and distress, anxiety and depression, as factors associated with higher FOR [14, 16, 21]. Weaker evidence has been reported for associations with disease and treatment variables, and inconsistent findings are reported for socio-demographic variables [14, 16, 21]. Prior mental health difficulties and existing psychiatric diagnoses are also risk factors [2].

Theoretical Formulation of FOR

A number of existing psychological theories have been applied to the understanding of FOR, including the self-regulation model of illness [22]; Self-Regulatory Executive Functioning Model (S-REF) [23]; Uncertainty in Illness Theory [24]; Social-Cognitive Processing Model [25]; Family Based Model [26]; and Existential Psychotherapy

[27]. Though these models focus on distinct theoretical approaches to understanding the phenomenon, they share a number of overlapping components which have been helpfully summarised by Simonelli and colleagues [2]. Central processes are said to include the existence of internal (e.g. physical symptoms) and external (e.g. cancer related media) triggers, which are interpreted via cognitive emotional processes. These processes are themselves influenced by the social context and other contextual factors (e.g. age, additional life stress, past coping), and result in more or less adaptive coping. This process results in the experience of a range of psychological and behavioural responses, the more unhelpful of which include for example excessive checking for physical symptoms, worry and panic, and excess utilisation of medical services such as seeking frequent contact for reassurance.

While evidence suggests a clear link between FOR and psychological distress, it remains unclear whether high levels of FOR lead to increased distress, or vice versa. Furthermore, while FOR is a common experience for cancer survivors, many do not develop psychological distress, raising questions about the processes mediating the relationship between FOR and negative outcomes. In order to develop effective interventions aimed at reducing the negative impact of FOR, the application of theoretical models to allow testing of specific hypothesised processes by which relationships between FOR and negative consequences exist is crucial.

A handful of authors have begun to approach the topic in this way. In one study, individuals with elevated FOR and increased use of avoidance, denial, wishful thinking and reassurance seeking coping strategies were found to have the highest levels of psychological distress and functional impairments [28]. In another, holding back (from talking about cancer related concerns) and low self-esteem were found to significantly mediate the effect of FOR on depression [29]. Investigation of this type of mediation model offers exciting possibilities, not only for identifying patients at higher risk of experiencing poorer psychological adjustment, but also for identifying mediating mechanisms that could be formulated as treatment targets in the development of new interventions to facilitate adjustment.

Interventions Targeting FOR

Whilst FOR is a common and potentially distressing issue for individuals transitioning to cancer survivorship, the development of interventions aimed at reducing its impact has been hindered by the fact that there is currently no agreed definition as to when it reaches problematic levels, and no gold-standard measurement tool [30]. Perhaps unsurprisingly then, evidence suggests that in many healthcare settings it is not being adequately addressed, with FOR having been reported as the most frequently endorsed unmet need among patients both immediately following treatment and 6 months later [31-32]. There have been a handful of studies testing interventions specifically aimed at reducing FOR in cancer patients. The first review of such interventions was recently published by Dawson and colleagues [33], and indicates that patient coaching/communication training, counselling, and mindfulness are potentially beneficial intervention approaches which require further exploration.

Psychological Flexibility

Due to the possibility that exists for all cancers to recur, FOR is an understandable and common experience. However, it is inherently threatening, and as such individuals may attempt to avoid or control these experiences. Such attempts are likely to be unsuccessful, in part due to exposure to potential triggers (e.g. physical symptoms; news about cancer; learning of the diagnosis of another). Therefore, acceptance-based models are intuitively appealing to conceptualising and developing interventions to address FOR.

One such conceptual model which can be applied to understanding the impact of FOR on adjustment outcomes is that of psychological flexibility, the overarching framework within Acceptance and Commitment Therapy (ACT, said as one word) [34]. Within this framework, it is not aversive internal experiences themselves but persistent attempts to control and avoid them which can lead to or exacerbate

psychological distress, and reduce engagement in valued activities [35]. In contrast to the majority of psychotherapies, the goal of ACT is not symptom reduction, but to encourage patients to accept, let go of and become less dominated by unpleasant internal experiences, in order to live a more valued and meaningful life. It does not seek to examine the validity or 'truth' of experiences or attempt to modify thoughts, feelings and physical experiences directly, but focusses on changing how individuals relate to these experiences [36].

ACT uses acceptance and mindfulness skills to increase psychological flexibility, defined as *'the ability to contact the present moment more fully as a conscious human being, and to change or persist in behaviour when doing so serves valued ends'* [37, p.5]. Six overlapping core processes are conceptualised within the psychological flexibility model – acceptance, cognitive defusion, being present, self as context, values, and committed action, with psychological inflexibility being the converse of these processes [36]. Within this 'hexaflex' of positive psychological processes, two main overlapping groupings are identified as mindfulness and acceptance processes, and commitment and behaviour change processes [36].

There is growing evidence that psychological flexibility mediates the relationship between negative symptom experiences and outcomes in chronic pain [38-39]; Irritable Bowel Syndrome [40]; and tinnitus [41], to name but a few. The recent work of Garland and colleagues [42] has further provided insight into the process by which higher levels of dispositional mindfulness links via positive reappraisal, greater attention to positive information, and increased savouring, to outcomes of higher QOL and lower emotional distress.

A few authors have begun to explore the relevance of the model in understanding adjustment to cancer. For example, Ciarrochi and colleagues [43] reported that success in living according to values was associated with reduced distress and increased wellbeing in a sample of mixed cancer patients, and Gillanders *et al.* [44], reported that psychological flexibility was predictive of distress even after variance associated with known predictors (appraisals and avoidance coping) was accounted

for. Furthermore, a handful of recent intervention studies have provided preliminary evidence for the effectiveness of acceptance-based interventions with cancer patients [45-47]. To date, there are only two known studies which have investigated the effectiveness of acceptance-based interventions for addressing FOR in cancer survivors [48-49]. Preliminary results from these studies are promising, suggesting that the intervention leads to improvements in fear of cancer recurrence and related outcomes at this point in the cancer journey.

Aims of Current Study

Applying a psychological flexibility model to understanding the impact of FOR could have useful clinical implications. Firstly, it could potentially enable more effective screening for those who are likely to be at increased risk of distress and reduced QOL as a result of FOR. Secondly, it could inform the development of a brief intervention to increase psychological flexibility as a way of reducing the impact of FOR. This is particularly important given that health professionals have indicated a desire for increased knowledge about effective strategies for managing FOR [50]. The current study takes an important first step in this process, by exploring the role of psychological flexibility in influencing the relationship between the experience of fear of cancer recurrence and poorer adjustment in terms of increased distress and reduced QOL. It was hypothesised that when individuals relate to FOR in a psychologically inflexible way, they may engage less in value driven activity, and experience increased distress and reduced QOL. Conversely, individuals who relate to FOR with psychological flexibility and continue to engage in valued activity might be expected to be less negatively impacted.

As the field of ACT research is in its relative infancy, there is currently no agreed 'gold standard' method of measuring psychological flexibility. A secondary study aim was therefore to compare the performance of an overall measure of psychological flexibility versus individual measurement of the component parts of

the construct (e.g. experiential avoidance, cognitive fusion, mindfulness, and valued living).

Methods

Design

The study employed a cross-sectional questionnaire design, in which self-selected cancer survivors were recruited to complete a battery of validated self-report questionnaires measures on one occasion. Within the UK, there is large variability within models of hospital follow up post cancer treatment, dependent on cancer type [51]. The population of interest was therefore a potentially hard-to-reach group. To address this, a mixed paper-based and online data collection approach was used, in conjunction with recruitment via third sector cancer support services. Internet based research is a relatively new tool within psychological research and offers a number of potential benefits including: collection of a large data set from range of demographic groups; elimination of potential researcher bias in recruitment and data collection; and facilitation of enhanced self-disclosure from participants [52]. There is evidence to support the validity and reliability of psychological measures administered online versus. using pen and paper [53], including ACT specific measures [54].

Procedure

Ethical approval for the study was granted by the University of Edinburgh School of Health in Social Science Research Ethics Committee, and the South East Scotland Research Ethics Committee (REC Reference: 15/SS/0116). Potential participants were informed about the study through adverts posted online and within local cancer support organisations, and information disseminated via relevant social media. Interested individuals were invited to contact the researcher if they wished further information, or to request a paper copy of the questionnaire pack. Questionnaire packs were also made available within local cancer support centres. Those wishing to complete the study online were invited to click on the web-link to proceed to the study page. All participants were informed of the study's aims, methods, likely

risks, freedom to withdraw or decline at any time, storage, retention and processing of data. Having received this information, choosing to take part by completing the eligibility form and questionnaire pack was taken to imply consent. Participants were made aware that as all answers were non-identifiable they could not be deleted once provided.

Sample

Inclusion and Exclusion Criteria

Individuals eligible to take part in the study were those who were aged 18 or over; able to read in English; had received a diagnosis of any cancer; had completed curative cancer treatment, including surgery, chemotherapy, radiotherapy (or any combination of these treatments); and had no evidence of current cancer. Those receiving ongoing hormonal or Herceptin treatments were also eligible, consistent with the majority of similar research studies in the field of cancer survivorship [e.g. 55]. All cancer types were included in the study due to insufficient evidence to suggest substantial differences in prevalence rates of psychological distress and FOR between different cancers [14].

Changes to Planned Study Protocol

The original study protocol defined eligibility as above, with the additional requirements that individuals were resident within the UK, and had completed their cancer treatment within the preceding 24 months. However, in the initial months of recruitment, it became apparent that these additional criteria may be too restrictive, and be preventing interested individuals who felt the research was relevant to them from taking part. Therefore, these criteria were removed following approval from the research ethics committee, and recruitment continued with the more inclusive criteria. The relative numbers of participants recruited prior to and following the widening of criteria was 32 and 43 respectively.

Measures

Participants completed eight self-report measures relating to the variables of interest, on one occasion. The format did not differ between the paper

questionnaires and those completed online. Demographic information on participants' gender, age, cancer type, year and month of diagnosis, treatments received, month and year of treatment completion, and any previous cancer diagnoses and treatment was also collected.

Fear of Recurrence

The Fear of Cancer Recurrence Inventory (FCRI) short form [56] is a 9 item self-report questionnaire measuring the severity of FOR experienced. Higher scores on the measure indicate increased severity of FOR. It was developed by the original authors from their 42-item original measure. Initial validation indicated that the 9-item severity subscale has been shown to be highly correlated with the total measure score ($r=.84$). Internal consistency for the current study was good, with a Cronbach's alpha of 0.86. The authors suggest the use of this subscale as a short form of the measures for screening purposes, and to date it has been the most widely used brief screening tool for FOR [57].

Psychological Flexibility – Overall Measure

The Acceptance and Action Questionnaire II (AAQII) [58] is a seven-item questionnaire measuring the overall construct of psychological flexibility. Items are rated on a 7-point Likert scale from 1=never true, to 7=always true, giving a total score between 7 and 49. Higher scores on the measure indicate greater levels of psychological inflexibility. It has been shown to have good test-retest reliability ($r=0.81$ at 3 months, $r=0.79$ at 12 months) and discriminant validity, and in the current study had very good internal consistency of 0.94. It is currently the most widely used general measure of psychological inflexibility, and was selected for the study based on its brevity and superior internal consistency to the 9-item version.

Psychological Flexibility – Individual Process Measures

The 15 item Brief Multidimensional Experiential Avoidance Questionnaire (BMEAQ) [59] contains 15 items measuring avoidance of: pain; uneasiness; effort; upset; unpleasantness; discomfort; emotions; painful emotions; feelings; bad feelings; upsetting feelings; fear/anxiety; unpleasant memories; and doubts. Each

item is scored on a 6-point likert scale from strongly disagree (1) to strongly agree (6), with item 6 being reversed. The item scores are then summed, with higher total scores indicating higher levels of avoidance. The BMEAQ has been validated using a variety of samples, and shown to have good construct validity, and strong convergence with the 6 dimensions of experiential avoidance measured with the original 62 item MEAQ [59]. In the current study, the internal consistency of the measure was good, with a Cronbach's Alpha of 0.88.

The Cognitive Fusion Questionnaire (CFQ) [54] is a 7-item questionnaire measuring the relationship individuals have with their cognitions on a continuum of fused (entangled with, believed, dominated by) to defused (able to view from detached perspective as mental events not necessarily to be acted on) [54]. The measure has been validated with a range of populations, including cancer and survivor populations. It has been shown to have good test-retest reliability and adequate divergent validity [54]. In the current study, the internal consistency of the measure was excellent, at 0.94.

The 16 item Engaged Living Scale (ELS) was developed by Trompetter *et al.*, [60] to measure valued living and committed action. The self-report questionnaire contains 10 items measuring valued living and 6 items measuring life fulfilment, all measured on a 5-point Likert scale from 'completely disagree' to 'completely agree'. Higher scores indicate higher levels of value based living. Originally developed in Dutch, it has been reliably translated into English. To date, the questionnaire has been validated with non-clinical and chronic pain samples, and demonstrated good construct validity (moderate to high correlations with AAQ-II scores) [60]. In the current study, the measure had an excellent level of internal consistency, with a Cronbach's Alpha of 0.92.

The Mindful Attention Awareness Scale (MAAS) [61] is a 15 item questionnaire measuring dispositional mindfulness, or the extent to which an individual is attentive to and aware of the present moment. The items assess the frequency with which an individual is mindful in a range of general and specific situations. Each

item is rated on a Likert scale between 1 (almost always) and 6 (almost never). The mean of the total item score is then calculated to provide an overall measure of mindfulness, with higher scores reflecting greater mindfulness. The measure has been validated with student and general adult samples [61], and shown to have good convergent and discriminant validity. It has been further validated with a modest sample of cancer outpatients [62], and was suggested to be an appropriate measure of mindfulness within cancer populations. In the current study, the measure had good level of internal consistency, with a Cronbach's Alpha of 0.90.

Psychological Distress

The Hospital Anxiety and Depression Scale (HADS) [63] is a 14-item questionnaire developed to measure symptoms of anxiety and depression within populations with physical illness. It contains 7 items for anxiety and 7 for depression, each scored from 0 to 3, with higher scores indicating increased levels of distress. The HADS is widely used in research and clinical practice, and has been shown to have good concurrent validity [64]. In the current study, the Cronbach's alpha of the measure was 0.79 for the anxiety subscale, and 0.80 for the depression subscale, indicating good internal consistency.

Quality of Life

The Functional Assessment of Cancer Therapy – General (FACT-G) questionnaire [65] is the most widely used self-report measure of QOL in cancer populations. It contains four subscales of: physical well-being (7 items); social/family well-being (7 items); emotional well-being (6 items); and functional wellbeing (7 items). All items are measured on a 5-point scale from 0 (not at all) to 4 (very much), and higher scores indicate higher perceived QOL. The questionnaire has been validated with mixed cancer patients and long-term survivors. It has been shown to have good convergent and discriminant validity, and good test-retest reliability (correlations coefficients between .82 and .92) [65]. Only the physical, social/family, and functional well-being subscales were utilised in this study, as the emotional wellbeing subscale contains items which overlap with distress and FOR constructs

(e.g. I worry that my condition will get worse). The developers have suggested that individual subscales can be used as appropriate, and that the measure is suitable for computer based administration [66]. The Cronbach's Alpha of the subscales in the current study ranged from 0.75 to 0.86, indicating acceptable to good internal consistency of the measure.

Statistical Analyses

A Priori Sample Size Calculation

An a priori sample size calculation estimated that a minimum sample size of 146 participants was required, based on a power level of 0.8 and significance level of 0.05. At the time of completion, there have been no previous studies investigating the relationship between FOR, psychological flexibility, distress and QOL, therefore the estimate was based on detecting a medium effect size or larger. The power calculation was completed using G*POWER 3 [67].

Preliminary Analyses

All data analyses were performed using SPSS 23 (IBM SPSS 23). Preliminary steps involved screening of the data to identify missing data and outliers, and establish that the data met necessary assumptions for parametric statistical testing.

Exploration of the frequency and potential patterns of missing data revealed a very small total amount of missing values from the dataset (0.9%). Across cases, there was one case which was identified as having a proportionately larger amount of missing data (14%). However, as the case contain less than 20% missing data it was retained in order to preserve power. Item level analysis across the sample revealed that the two items with most missing data were items 6 and 7 on the FACT-G social/family wellbeing subscale (8.3% and 18.1% respectively). These items related to the quality of main supportive relationships, and satisfaction with sex life. It could be hypothesised that these items contained more missing data because of perceived non-applicability, as well as potential discomfort in answering questions of this nature, and possibly therefore be missing not at random (MNAR), that is, to be missing based in a pattern relating to a variable which had not been recorded. It

was also identified that there were three other items with >5% of missing data, all from the MAAS (q13, q14, & q15). Examination of completed paper questionnaire responses revealed that due to formatting, these three items appeared over the page from the scoring instructions, and therefore are likely to have been missing by design. These items could therefore be assumed to be missing completely at random (MCAR). To aid decision making around the approach taken to deal with missing data, Little's Missing Completely at Random (LCAR) test [68] was performed and was not found to be significant, indicating that overall, missing values were likely to be missing in a random pattern.

Based on these findings, an expectation maximisation approach was selected to impute missing data. This method of imputation predicts most likely values based on the data provided [69], and has been suggested to be the most robust way of dealing with missing data where there are small amounts of missing data which are missing at random [70]. This approach was selected in place of a deletion method which may have introduced bias in the case that the values were not missing completely at random, as well as reducing the power of the analysis.

Participant demographics were explored using descriptive statistics. All variables were assessed for potential outliers, based on a calculation of the differences between the upper and lower quartiles multiplied by 3 [71]. Visual examination of histograms and calculation of z scores for skewness and kurtosis revealed that all variables were normally distributed. Data were therefore found to meet basic assumptions required for the use of parametric statistical tests [72].

Further tests to establish that the data met assumptions for regression analyses were carried out. Examination of partial regression plots and studentized residuals against predicted values confirmed the assumptions of linearity, homoscedasticity and normality of residuals. There was no evidence of multicollinearity, as indicated by all tolerance values being greater than 0.2. The assumption of independent errors was met, as assessed by a Durbin-Watson statistic close to 2 in all cases, and Cooks and Mahalanobis distances were within acceptable limits [72].

Results

Participant Demographics

Recruitment to the study took place between September 2015 and June 2017. During that period, there were a total of 3,511 views of the study information homepage. Of the 92 individuals who opted to take part in the online questionnaire, 6 (7%) were screened out through the eligibility questions; 27 (29%) ceased participation during the eligibility screening and demographic information questions; and 8 (9%) ceased participation during completion of the outcome measure questions, leaving an incomplete dataset. This left a total of 51 complete online participant responses for analysis. Of the paper questionnaire packs returned (n=27), 2 were screened out through the eligibility questions, and 1 was ruled to be ineligible through free text comments about treatment outcome, leaving 24 complete paper responses for analysis. This gave a total combined final sample of 75.

The majority of participants were female (92.0%), with a mean age of 51.9 years (range 19-88). Most participants had completed treatment for breast cancer (69.3%), while the rest of the sample was made up of mixed cancer survivors. Although breast cancer remains the most common cancer within the UK, accounting for 15% of all cases [1], it remains over-represented within the sample. Conversely, lung and prostate cancer were under-represented within the sample, with only one lung cancer and no prostate cancer patients taking part, despite these cancers each accounting for 13% of all cases [1].

Average mean time since diagnosis was 3.5 years (range 0 – 28 years), and the mean average time since treatment completion was 2.2 years (range 0 – 9), with 71.2% of the sample having completed treated within the past 2 years. Most patients had undergone surgery (90.7%); with a majority having also undergone chemotherapy treatment (69.3%) and/or radiotherapy treatment (70.7%). Around half of the sample (48.0%) were receiving ongoing adjuvant hormonal therapy at the time of participation.

Table 1b. Descriptive statistics for key participant characteristics

Characteristic	Mean (SD, %)
Age (years)	51.9 (12.0)
Gender	
<i>Male</i>	6 (8.0%)
<i>Female</i>	69 (92.0%)
Cancer type	
<i>Breast</i>	52(69.3%)
<i>Haematological</i>	6 (8.0%)
<i>Colorectal</i>	4 (5.3%)
<i>Brain</i>	3 (4.0%)
<i>Upper GI</i>	2 (2.7%)
<i>other*</i>	8 (10.7%)
Time since diagnosis	
<i>Total sample mean</i>	3.5 (4.5)
<1 year	6 (8.1%)
1 Year	18 (24.3%)
2 years	19 (25.7%)
3 years	9 (12.2%)
4 years	6 (8.1%)
5 years	6 (8.1%)
More than 5 years	10 (13.3%)
Not known	1 (1.3%)
Surgery	
<i>yes</i>	68 (90.7%)
<i>no</i>	7 (9.3%)
Chemotherapy	
<i>yes</i>	52 (69.3%)
<i>No</i>	23 (30.7%)
Radiotherapy	

<i>yes</i>	53 (70.7%)
<i>no</i>	22 (29.3%)
Hormonal treatment	
<i>yes</i>	35 (46.7%)
<i>no</i>	39 (52.0%)
<i>not known</i>	1 (1.3%)
Herceptin	
<i>yes</i>	14 (19.2%)
<i>no</i>	59 (80.8%)
<i>not known</i>	2 (2.7%)
Time since treatment completion	
<i>Total sample mean</i>	2.2 (1.7)
<i><1year</i>	6 (8.2%)
<i>1 year</i>	25 (34.2%)
<i>2 years</i>	21 (28.8%)
<i>3 years</i>	4 (5.5%)
<i>4 years</i>	7 (9.6%)
<i>5 years or more</i>	10 (13.3%)
<i>not known</i>	2 (2.7%)
Current hormonal treatment	
<i>yes</i>	36 (48.0%)
<i>no</i>	39 (52.0%)
Previous cancer diagnosis	
<i>yes</i>	4 (5.3%)
<i>no</i>	70 (93.3%)
<i>not known</i>	1 (1.3%)
Country in which treatment was completed	
<i>UK</i>	73 (97.3%)

<i>Europe</i>	1 (1.3%)
<i>Other</i>	1 (1.3%)

*Other included lung, melanoma, gynaecological, thyroid, kidney, and testicular cancers.

Levels of FOR, Distress and QOL

Table 2b provides a summary of the mean predictor and outcome variable scores sample. Comparisons were made with general population and cancer normative scores (from mixed treatment status patients), where available. The mean FOR score for the sample was 20.03, which is considerably higher than the cut-off of 13, suggested to indicate clinical levels [57]. Comparison with total QOL (FACT-G) norms was not possible as, for the reasons described earlier, the emotional wellbeing subscale was not used in the current study. However, comparison of the three subscale scores which were used with both general population [73] and cancer patient [74] samples indicates that current sample had generally poorer QOL than both groups, except for the physical wellbeing subscale, where scores were lower than general population norms but higher than other cancer samples. This suggests the current sample were generally less troubled by difficulties with their current physical health than the overall general cancer population, which is in keeping with the fact that the sample were all post treatment cancer patients who were a few years from the end of treatment. In line with recommendations [75] median distress (HADS) scores were compared with normative median values rather than comparing proportions of participants meeting cut offs for clinical levels of distress. Comparison with data from a UK general population sample indicates that HADS scores for this sample were higher than normative levels for both anxiety (8.63 vs. 6.14) and depression (5.63 vs. 3.68) [76], and slightly higher than cancer population norms (anxiety 7.5, depression 3.3) [77].

Table 2b. Summary of Descriptive Statistics for Predictor and Outcome Variables

Variable	Range of Possible scores	Mean score	SD	Range
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Predictor Variables

FCRI-Severity	0 – 36	20.03	6.58	2 – 34
BEAQ	15 – 90	50.66	14.38	16 – 80
ELS Total	0 – 80	55.80	13.35	19 – 80
MAAS	15 – 90	56.05	13.57	20 – 88
CFQ	7 – 49	26.96	8.72	7 – 45
AAQ-II	7 – 49	23.02	9.36	7 – 42

Outcome Variables

FACT-G Total	0 – 84	59.09	12.41	23 – 83
HADS				
Anxiety	0 - 21	8.63	3.80	0 – 17
Depression	0 - 21	5.63	3.76	0 – 17
Total	0 – 42	14.25	6.77	0 – 31

Note: FCRI = Fears of Cancer Recurrence Inventory, BEAQ= Brief Experiential Avoidance Questionnaire, ELS= Engaged Living Scale, MAAS= Mindful Awareness and Attention Scale; CFQ= Cognitive Fusion Questionnaire, AAQ-II= Acceptance and Action questionnaire II; FACT-G= Functional Assessment of Cancer Therapy; HADS= Hospital Anxiety and Depression Scale

Covariate Analyses

Analysis of variance (ANOVA) was performed between categorical demographic and clinical variables of gender and treatments received (i.e. surgery; chemotherapy; radiotherapy; hormonal therapy; and Herceptin), to identify potential confounding

variables. None were significant ($p < 0.05$), except for Herceptin, whereby FOR scores were significantly higher in those who had received Herceptin treatment relative to those who had not ($F = 7.15$, $p < .01$). Correlation analyses were also run between continuous variables of age, time since diagnosis, and time since treatment completion. Both time since diagnosis and time since treatment completion were significantly negatively correlated with FCRI total scores, in that as time since diagnosis and treatment completion increased FCRI scores reduced ($r = -.448$, $p < .01$; $r = -.460$, $p < .01$). A positive correlation was also found between age and mindfulness, with mindfulness scores increasing with increasing age ($r = .360$, $p < .01$). Age, time since diagnosis, time since treatment, completion method and Herceptin treatment were therefore included as covariates within the planned multiple regression and mediation analyses. However, in both cases entering the covariates into the model did not significantly change the findings, therefore all analyses' results presented are without the inclusion of covariates in order to preserve power.

Correlation Analyses

Bivariate Pearson's correlations were initially performed to explore direct associations between all variables. Results are presented in table 3b. Generally strong correlations were found in directions consistent with existing research and theory. As all outcome variables were significantly correlated with at least one of the predictor variables, all were retained for regression analyses.

Table 3b. Correlation matrix presenting correlations between predictor and outcome variables

	1	2	3	4	5	6	7	8	9	10
1										
2	.364 **									
3	-.247*	-.542**								
4	-.446**	-.550**	.462**							
5	.450**	.595**	-.653**	-.421**						
6	.416**	.495**	-.490**	-.420**	.819**					
7	-.265*	-.161	.396**	.156	-.366**	-.344**				
8	.517**	.477**	-.500**	-.529**	.679**	.661**	-.495**			
9	.310**	.425**	-.500**	-.371**	.449**	.403**	-.664**	.611**		
10	.461**	.502**	-.557**	-.502**	.629**	.593**	-.645**	.898**	.897**	

** correlation significant at the 0.01 level (2-tailed), * correlation significant at the 0.05 level (2-tailed)

Note: 1= Fears of Cancer Recurrence Inventory (FCRI), 2= Brief Multidimensional Experiential Avoidance Questionnaire (BMEAQ), 3= Engaged Living Scale (ELS), 4= Mindful Attention Awareness Scale (MAAS), 5= Action and Acceptance Questionnaire II (AAQII), 6= Cognitive Fusion Questionnaire (CFQ), 7= Functional Assessment of Cancer Therapy – General (total) (FACT-G), 8= Hospital Anxiety and Depression Scale – Anxiety subscale (HADS-A), 9= Hospital Anxiety and Depression Scale – Depression subscale (HADS-D), 10= Hospital Anxiety and Depression Scale Total Score (HADS- Total)

Multivariate Analysis

Incremental Validity Assessment of Measures of Psychological Flexibility

In order to decide on the most appropriate measure of psychological flexibility to use, i.e. the overall measure (AAQ II) or the individual process measures (experiential avoidance, mindfulness, cognitive fusion and valued living), hierarchical multiple linear regression analyses were conducted to allow exploration of the incremental predictive validity of each approach over the other [78]. As there is currently no agreed consensus on any one 'gold standard' measure of psychological flexibility, the hierarchical regressions were run twice, first considering the incremental predictive efficacy of the AAQ over and above the variance explained by the individual process measures, and then vice versa. A forced method of entry was used, in which step one involved entering the four process measures (experiential avoidance; cognitive fusion; mindfulness and valued living), followed by the overall measure (AAQ II) at step 2, and vice versa. The change in predictive ability of the model between each step was then examined.

For the first regression predicting QOL (QOL), the overall model including all five predictors accounted for 13.3% of the variance in QOL scores (adjusted $R^2 = .133$) and was statistically significant ($F(5,69) = 3.264, p < 0.05$). Addition of the overall psychological flexibility measure into the model increased the predictive ability of QOL only by a very small amount of 0.3% (R^2 change = 0.003), which was not a statistically significant change, $p = .606$ ns. The introduction of the individual process measures at step 2 increased the variance predicted by a larger amount (6.2%), although this change was also not statistically significant ($p = .271$ ns).

For the regression predicting anxiety, the model including all five predictors accounted for 54.6% of the variance in HADS anxiety scores (Adjusted $R^2 = .546$), and was highly significant $F(5,69) = 18.814, p < .001$. The addition of the overall psychological flexibility measure into the model increased the amount of variance

explained by a small amount of 3.2% (R^2 change = .032), which was a statistically significant increase ($p < .05$). When the analysis was repeated other way round however, the addition of the individual process measures to the single measure to increase the predicted variance by an additional 10.9%, which was a statistically significant increase ($p < .01$).

For the model predicting depression, the overall model including all five predictors accounted for 26.4% (Adjusted $R^2 = .264$) of the variance in HADS depression scores, and was highly significant ($F(5,69) = 6.304, p < .001$). In this case the addition of the overall psychological flexibility measure into the model did not increase the predictive efficacy of the model at all (R^2 change = 0.00, $p > 0.05$), however results from analyses with the individual measures introduced at the second step showed that they increased the predicted variance by 11.4%, and that this was a statistically significant change ($p < .05$).

Taken together, these results indicate that although the incremental increase in predictive ability between the two measurement approaches was more prominent for the measurement of anxiety and depression outcomes than for QOL, the overall performance of the measures indicate that use of the individual process measures of psychological flexibility offers increased predictive power over and above what can be predicted using the AAQ-II. The remainder of the analyses were therefore performed using the four individual measures capturing the construct of psychological flexibility.

Prediction of Anxiety, Depression and QOL

The next stage in the analyses involved conducting a series of single step multiple regressions to examine the relative predictive ability of the independent variables of FOR and psychological flexibility on the outcomes of QOL and distress.

The first model assessed the predictive power of the five independent variables on overall QOL, as measured by the total of the three FACT-G subscale scores (physical wellbeing, social-family wellbeing, and functional well-being). When entered into the model, the five predictors accounted for 17.4% of the variance in overall QOL

(adjusted $R^2=.174$), and the model was statistically significant ($F(5,69)=4.117, p<.01$). Examination of the relative predictive power of variables revealed that only valued living significantly predicted the total QOL score ($\beta=.386, p<.05$).

The second set of regression analyses testing the five predictor variables on anxiety, showed that overall the model predicted 53.4% of the variance in HADS anxiety scores (adjusted $R^2=.534$), and the model was highly significant ($F(5,69)=17.944, p<.0001$). Looking at the relative predictive value of individual variables, both FOR and cognitive fusion significantly predicted anxiety (FOR $\beta=.224, p=.019$; CF $\beta=.412, p<.0001$).

For the model of depression, the five predictors together accounted for 26.6% of the variance in HADS depression scores, which was highly significant ($F(5,69)=6.356, p<.001$). Of the individual predictor variables, only valued living significantly predicted variance in the total depression score ($\beta=-.325, p<.05$).

Table 4b. Results of linear regression analyses for the prediction of QOL, anxiety and depression

	β	T	P	Adj. R ²	F (5,69)	P
Dependent variable: Overall QOL (Total FACT-G score)						
FOR	-.192	-1.547	.126			
Experiential Avoidance	.158	1.116	.268			
Valued Living	.386	2.864	.006			
Mindfulness	-.103	-.752	.455			
Cognitive Fusion	-.197	-1.476	.144			
Model summary				.174	4.117	.002
Dependent Variable: Anxiety (HADS-Anxiety score)						
FOR	.224	2.411	.019			
Experiential Avoidance	.008	0.073	.942			
Valued Living	-.156	-1.540	.128			
Mindfulness	-.180	-1.748	.085			
Cognitive Fusion	.412	4.109	.000			
Model Summary				.534	17.944	.000
Dependent Variable: Depression (HADS-Depression score)						
FOR	.113	.967	.337			
Experiential Avoidance	.120	.897	.373			
Valued Living	-.325	-2.561	.013			
Mindfulness	-.058	-.445	.657			
Cognitive Fusion	.113	.896	.373			
Model Summary				.266	6.356	.000

Mediation Analysis

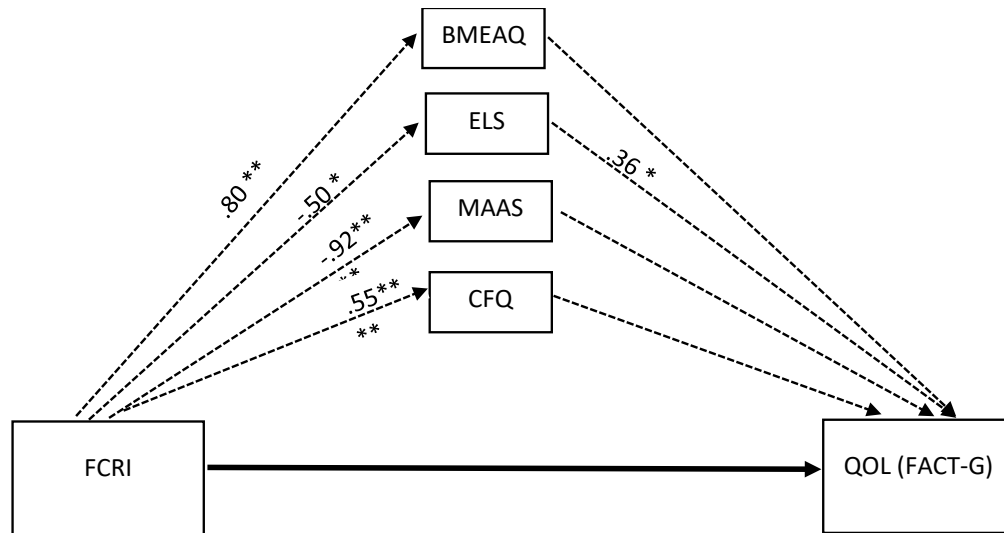
Taken together, the results of multiple regression analyses indicated that FOR and psychological flexibility significantly predicted both QOL and distress within the sample. Of the psychological flexibility process measures, only the processes of cognitive fusion and valued living emerged as significant predictors of distress and QOL. To test the theoretically driven hypothesis that the relationship between FOR and both QOL and distress would be mediated by these psychological flexibility processes, Conditional Process Analysis [79] was performed. The advantage of this method is that it allows identification of the relative contributions of direct and indirect effect pathways on outcomes using more complex modelling techniques than is possible with standard regression analyses, and has increased power to detect indirect effects than other mediation methods [79]. Bootstrapped confidence intervals were calculated, whereby repeated 'bootstrap' samples were taken (in this case 10,000 times) to provide a more robust estimate of sample parameters [72]. Where the 95% confidence intervals do not include zero, the path effect is considered to be significant at the $p < .05$ level.

Mediating Role of Psychological Flexibility on the Relationship between FOR and QOL

Separate mediation models were testing for each of the three outcomes of interest; QOL, anxiety and depression.

The model predicting QOL explained 23% of the variance in QOL scores ($R^2 = .23$, $F(5,69) = 4.12$, $p < .001$). FOR did not directly predict QOL, however the total effect of the model including all the mediating variables was a significant predictor. Looking at the relative indirect effects of the individual process measures, the path is mediated through valued living, whereby higher FOR leads to reduced QOL via reduced valued living. None of the other process measures significantly mediated the relationship.

Figure 1b. Conditional Process Analysis – Results for QOL



Numbers on the paths represent standardised β coefficients * $p < .05$, ** $p < .01$

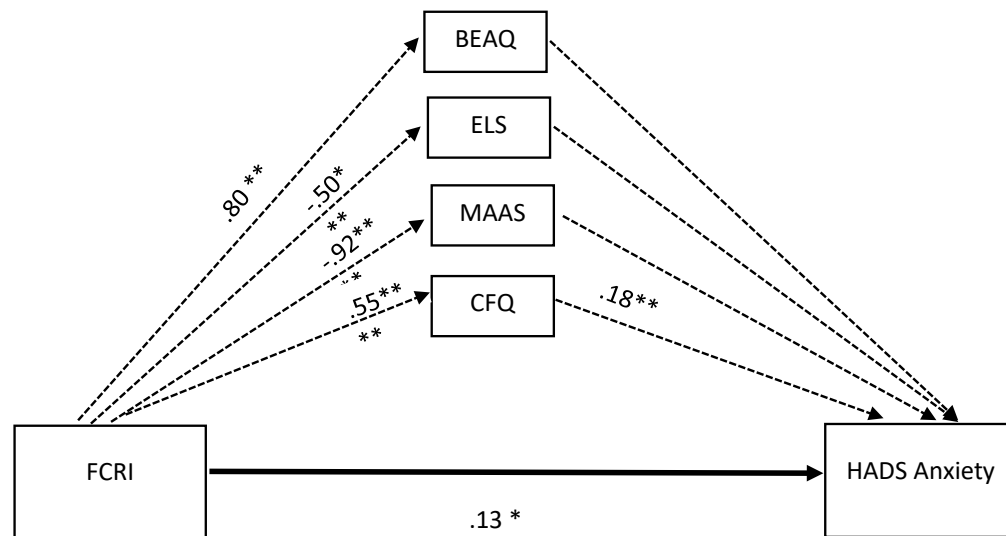
Significant paths shown (—→ = direct path, ----→ = indirect paths), * $p < .05$, ** $p < .01$

Path	Bootstrapped Confidence Intervals	
	LL	UL
Direct effect of FOR on QOL	-.83	.10
Total indirect effects	-.92	-.08
FOR to experiential avoidance to QOL	-.03	.18
FOR to engaged living to QOL	-.23	-.01
FOR to mindfulness to QOL	-.05	.19
FOR to cognitive fusion to QOL	-.27	.02
Total model: $R^2 = .23$, $p = .01$ $f^2 = 4.12$		

Note: LL= Lower limit of Confidence, UL= Upper limit of confidence

For anxiety, 57% of the variance in anxiety scores was predicted by the model ($R^2=.57$, $F(5, 69) = 17.94$, $p<.001$). Within this model, there was a significant indirect effect of all mediating variables on FOR. While this effect attenuated the direct predicting power of FOR on anxiety the direct effect remained significant. Looking at individual process measures, only cognitive fusion had a significant indirect effect, suggesting higher cognitive fusion to partially mediate the relationship between higher FOR predicting higher anxiety scores.

Figure 2b. Conditional Process Analysis – Results for Anxiety



Numbers on paths represent standardised β coefficients * $p<.05$, ** $p<.01$

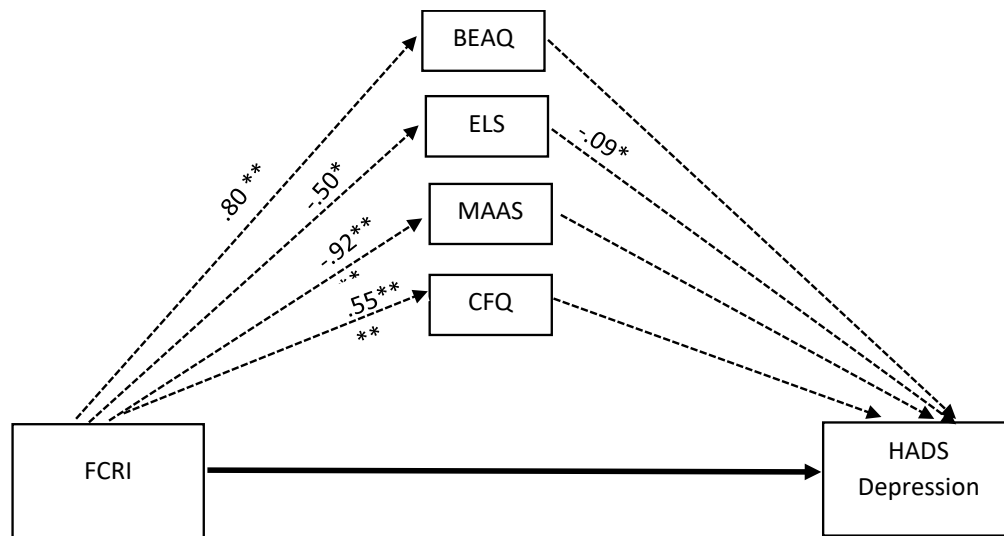
Significant paths shown (—→ = direct path, ----→ = indirect paths), * $p<.05$, ** $p<.01$

Path	Bootstrapped Confidence Intervals	
	LL	UL
Direct effect of FOR on Anxiety	.02	.24
Total indirect effects	.11	.46
FOR to experiential avoidance to anxiety	-.08	.08
FOR to engaged living to anxiety	-.01	.14
FOR to mindfulness to anxiety	.00	.21
FOR to cognitive fusion to anxiety	.05	.35
Total model: $R^2 = .27$, $p = .00$, $f^2 = 26.68$		

Note: LL= Lower limit of Confidence, UL= Upper limit of confidence

The model for depression predicted 32% of variance in depression scores ($R^2=.32$, $F(5,69) = 6.36$, $p<.00$). The total combined indirect effect of all mediators on depression was significant, and when added to the model the direct effect of depression became non-significant. This indicates that together, the psychological flexibility **process** variables mediate the relationship between FOR and depression. However, when considering the mediating variables in turn, none individually significantly mediated between FOR and depression. It was considered possible that this finding may have been due to the different scoring systems employed between the mediating variable measures, with some measured in the direction of higher scores meaning better outcomes, and some higher scores meaning poorer outcomes. To test the hypothesis that this may have had a suppression impact on the mediation analysis, it was re-run having transformed the mediating variable total scores so that they all measured in the direction of higher scores equalling better outcomes. However, the results of this analysis were the same, and therefore only original analyses with unreversed scores are presented.

Figure 3b. Conditional Process Analysis – Results for Depression



Numbers on the paths represent standardised β coefficients * $p < .05$, ** $p < .01$

Significant paths shown (\longrightarrow = direct path, \dashrightarrow = indirect paths), * $p < .05$, ** $p < .01$

Path	Bootstrapped Confidence Intervals	
	LL	UL
Direct effect of FOR on Depression	-.07	.20
Total indirect effects	.02	.40
FOR to experiential avoidance to depression	-.05	.16
FOR to engaged living to depression	.00	.22
FOR to mindfulness to depression	-.09	.16
FOR to cognitive fusion to depression	-.04	.20
Total model: $R^2 = .10$, $p = .01$, $f^2 = 7.74$		

Note: LL= Lower limit of Confidence, UL= Upper limit of confidence

Discussion

Main Findings

Findings from this study suggest that fear of cancer recurrence plays an important role in predicting adjustment outcomes for cancer survivors. Consistent with findings from Humphris and colleagues [15], current data suggest a correlation between FOR and levels of psychological distress. However, in contrast to previous research [16], no direct relationship between FOR and QOL was found.

The current study also builds on existing literature by providing unique insights into the role of psychological flexibility in mediating the impact of experiencing fear of cancer recurrence on post treatment cancer survivors. Findings suggest that as an overall construct, psychological flexibility does not appear to mediate the relationship between fears of recurrence and distress and quality of life. However, two of the processes measured within the overall concept of psychological flexibility, valued living and cognitive fusion, did emerge as significant mediators. This suggests that increased fear about cancer recurrence, may impact negatively on individuals in part via its effect on increased entanglement with thoughts and decreased engagement in valued activity. Interestingly, levels of mindfulness and experiential avoidance were not supported by the current data as significant mediators of the impact of fear of cancer recurrence. These results are contrary to existing evidence pointing to the role of psychological flexibility in predicting outcomes [44,80], as well as to qualitative evidence suggesting increased levels of acceptance-based coping (as opposed to avoidance based coping) within breast cancer survivors predicted less distress and depression [81]. More broadly, findings also appear to be at odds with previous mediation studies reporting avoidance to be key in influencing the effect of FOR on cancer patients [82-83].

While the results of the current study do not support the role of psychological flexibility as an overall construct in understanding the nature and impact of FOR, they do suggest that the way in which an individual relates to their experiences of

fear is a key pathway through which these experiences negatively impact on wellbeing. This provides important information in terms of offering an alternative to the traditional CBT route of focussing on challenging the content such thoughts. The implications of this are twofold. Firstly, it suggests the potential use of screening for existing levels of cognitive fusion and value based living as a way of identifying those cancer survivors for whom high levels of FOR are more likely to lead to negative outcomes. Secondly, it highlights the potential for interventions aimed at helping individuals be less fused to and dominated by their thoughts, as well as helping them to live more successfully in accordance with their values, as a potential target for ameliorating adjustment outcomes in post treatment survivors. Given that FOR is to a degree a rational and normative response to cancer, focussing on these processes rather than challenging the content of such thoughts offers a target for intervention which is potentially more amenable to change.

Using more complex mediation modelling analyses, the current results provide useful insights into particular aspects of psychological flexibility which appear to play a key role in influencing outcomes. Findings suggest that living in accordance with one's values is the most important predictor of both QOL and depression, while the degree to which an individual is fused to their thoughts as well as the severity of their fears about the possibilities their cancer will recur appear to have the most significant influence on levels of anxiety. These findings are in line with previous evidence from Ciarrochi and colleagues [43], where valued living was significantly related to reduced distress and improved wellbeing in a cancer patient sample. They also corroborate the results of a recent study by Gillanders *et al.* [44], where cognitive fusion was found to be the strongest predictor of anxiety in a sample of mixed cancer patients. The failure to find support for the overall model of psychological flexibility, while supporting the mediating role of two individual processes measured within the overall concept of psychological flexibility raises interesting questions about the conceptualisation and measurement of the concept as a whole. Further research to replicate and extend these findings would therefore

be useful, to allow firmer conclusions to be drawn about the utility of the psychological flexibility model as a potential treatment target for this population.

In relation to the secondary research aim of exploring the incremental predictive validity of individual process measures versus an overall psychological flexibility measure, findings indicate that measurement of the construct at the individual process measures level allows for increased power to predict distress outcomes. The measures performed more similarly in predicting QOL, however the individual measures were still marginally better. The issue of the specificity of measures of ACT based constructs is an important one. Psychological flexibility is conceptualised as the overarching construct underlying six core processes of acceptance, mindfulness, cognitive defusion, self as context, values and committed action [34]. It is therefore understandable that the process measures have been found to correlate highly with each other. The AAQ [58] is a valid and popular measure which provides a robust overall assessment of psychological flexibility, and is therefore particularly useful when research is interested in initial explorations around the associations of psychological flexibility with different outcome variables or within new samples. However, once such associations have been identified, it could be argued that the use of process level measurement allows for the identification of individual elements of psychological flexibility emerging as key predictors. This could have important implications for the development of interventions which particularly target or focus on those elements found to account for the greatest variance in outcomes. Indeed, as was the case in the current study, measurement of individual processes rather than at the level of an overarching construct allows a more sensitive level of analysis which could potentially reduce the chances of both Type 1 and Type 2 errors being made.

Findings from the current study identified a number of potentially confounding variables. Firstly, a significant positive relationship between levels of mindfulness and age were observed. This is in line with findings from previous research [80]. The observed significant relationship between Herceptin treatment and higher

levels of FOR is interesting, and merits further exploration. It raises the question as to the perceptions that patients have around the meaning of being recommended this additional treatment. It is possible the findings relate to a further, unmeasured variable of total duration of treatment. Receipt of Herceptin treatment may extend the length of treatment, and it could be hypothesised that those who experience a longer treatment duration may have more difficulties adjusting to the 'new normal' of cancer survivorship. As Herceptin is a relatively new treatment, such questions have yet to be explored, and could be usefully addressed in future using qualitative approaches.

The finding that levels of fear of cancer recurrence decreased with increasing time since diagnosis and completion of treatment is in contrast with evidence from [84], who reported that FOR persisted for the duration of their study (18 months) for those individuals with high levels at the point of cancer surgery. This discrepancy may be due to the fact that the mean time since treatment completion in the current study was 2.2 years, and participants were included up to 9 years post treatment. This may have meant that relative to Savard & Ivers' study, a longer period of time had passed for participants during which FOR reduced. Indeed, two further studies found a similar pattern to the current findings of decreasing levels of FOR over time [85-86]. Neither study reported mean time since treatment completion, however for both sample the mean time since diagnosis was longer than within Savard & Ivers' study [84]. Further work to explore the unique trajectory of FOR would be helpful, in order to identify the best time to introduce screening and intervention. An ongoing UK study by Hulbert-Williams and colleagues [87] will offer crucial further information from a longitudinal perspective to inform this. This is an important consideration in light of current discord over establishing clinically meaningful levels of FOR [88]. Further work will be required to ensure intervention approaches in clinical practice achieve an effective balance between prevention of the development of long term symptom burden, while not pathologizing natural reactions to life threatening disease and allowing for the natural decline in FOR over time in a supported environment where required. In line with acceptance-based

approaches, considering the ways in which individuals relate and respond to FOR could contribute usefully to decisions around when best to offer intervention and for whom. In addition, successfully addressing processes such as cognitive fusion and living in accordance with values could allow acceleration of the natural process of habituation and reductions in FOR.

Despite the existence of these confounding variables, it is important to note that the mediating effects of cognitive fusion and valued living were evident even when they were controlled for within the analyses. This suggests the importance of considering these processes over and above factors such as time since treatment completion and age, in assessing individuals relative risk of poor outcomes [80].

Limitations of the Current Study

There are several limitations which should be considered when interpreting the results of the study. Firstly, participants were recruited mainly via third sector cancer support organisations. Such services provide emotional and practical support to individuals who are presumably open to addressing such issues. It is therefore possible that they were, as a sample, both more distressed and or more psychologically flexible than the cancer survivor population. This has the potential to somewhat limit the generalisability of the findings to other cancer survivor populations.

Secondly, the recruited sample consisted mostly of female breast cancer patients, who were relatively young in comparison to general cancer populations. The over representation of breast cancer patients in psycho-oncology research has been reported by many authors and in part can be accounted for by the fact that breast cancer represents the highest proportion of cancer diagnoses within the UK. Of relevance to the current study, there are also many more third sector support services specifically aimed at breast cancer than other cancer types. It may therefore be the case that breast cancer patients are more likely to engage in third sector support services and as a result more likely to be exposed to research recruiting within these settings. In any case, as has been highlighted by others, it is important

for future research to make efforts to specifically target harder to reach cancer groups, to ensure that their experiences and needs are considered and contribute to our understanding of the emotional experiences of cancer and the development of novel interventions. On the other hand, in relation to the specific topic of fear of cancer recurrence, previous reports have not found meaningful differences in levels of distress and FOR between different cancer types [14]. It is hoped therefore that the present results are generally reflective of mixed cancer survivor populations.

In relation to potential methodological limitations of the research, it is of note that the study was cross sectional in nature. As a result, although the use of mediation analyses provides some evidence to suggest potential processes linking FOR with the outcomes of interest, causation cannot be established. Larger scale longitudinal research would be helpful to elucidate this further. It is also recognised that due to the remote nature of recruitment methods, information around eligibility and clinical cancer related data was collected via self-report, rather than from validated medical sources, potentially reducing its reliability. However, several safeguards were put in place to try to mitigate this risk, including advertising the study via well-known and respected cancer support organisations, and requesting a minimum level of detail from participants regarding cancer related information, in order to cross validate their eligibility for the study. Furthermore, it was necessary to balance the risk of reduced reliability with using recruitment strategies which were feasible for accessing harder to reach populations equitably. Finally, it is noted that the current study did not collect information on time since participants' last contact with their medical team or GP in relation to their cancer. Although to some extent this information can be estimated from the time since treatment was completed, failure to specifically capture these details means it was not possible to consider the potential influence of this on levels of FOR and distress at the time of completion of the survey. It may be important for future studies to consider collecting information on these variables.

Despite exploring multiple avenues to maximise recruitment using a range of methods, the number of participants recruited to the study was lower than expected. The rate of recruitment of 3.6 participants per month was largely in keeping with reported median rates of recruitment to oncology RCTs in the UK [89]. However, with around 180 paper questionnaire packs made available via cancer organisations and over 3,500 individuals having viewed the information page for the online survey, the total of 75 completed responses is low. It is not possible to establish an exact recruitment percentage for comparison, as many individuals who viewed the survey may not have been eligible to take part. However, it is of note that another recent cross-sectional study with cancer survivors within the secondary care setting in the UK reported substantially higher recruitment rates (26%; [80]). It is possible that the topic itself may have been a barrier to completion, as clinicians and researchers alike have noted anecdotally that fear of cancer recurrence can be a challenging topic to engage cancer survivors in conversation. Within the UK, the recent introduction of post cancer treatment summaries [90] may go some way to address this, in addressing patient misunderstandings about risk of recurrence, and providing an opportunity to initiate discussion of the topic. Nevertheless, this issue has obvious implications for the success of future screening and intervention approaches on the topic, and it would also therefore be beneficial for qualitative approaches to address the question of how best to engage survivors in discussion around this topic and current barriers to this.

Current Barriers to FOR Research

There are a number of issues currently highlighted with the research around fear of cancer recurrence, which if addressed could help to advance scientific understanding of the phenomenon and the development of effective interventions. One such area is the considerable inconsistency in current terminology surrounding cancer survivorship. There are significant variations within both clinical and research settings with regards to what is meant by terms such as 'cancer survivor', 'successful treatment', and 'disease free'. This poses obvious difficulties in assessing

survivorship research, where comparisons between studies employing differing conceptualisations and definitions of survivorship can be challenging. Furthermore, for many patients themselves, cancer may be conceptualised as a chronic illness, and the term cancer survivor may not always be used or accepted. This is an important concept to be clarified by future research, particularly in light of evidence pointing to the existence of specific time points at which distress can emerge [3-5]. In practical terms, future survivorship research would benefit from specifying time from end of primary treatment to entry into the study, something which is currently not always stated [91]. Not only is this important to clarify in terms of ensuring meaningful research comparisons, but clinically, clarification of terminology may have a direct influence on distress and FOR in terms of affecting patient perceptions around disease status and likely prognosis.

Another area which has recently begun to be addressed, is that of consensus around the theoretical underpinning and definition of FOR, and agreed standard tool for its measurement [30, 88, 92]. Currently, a range of measurement tools have been utilised across research into FOR, limiting the degree to which research can reliably be compared and amalgamated. Perhaps more importantly, current differences in whether or not FOR is defined in terms of its severity or, more commonly, in a multidimensional way incorporating both its severity and consequences, have fundamental implications for the utility and purpose with which the tool is used [88]. In line with the theoretical argument proposed by the current study, it could be argued that levels of severity (which could be conceptualised as the content and frequency with which the fears are experienced) should be considered as distinct from the consequences of such fears, which are likely to be influenced by a number of mediating factors.

It is encouraging that FOR has been increasingly recognised in recent years as an important concern for cancer survivors, and that this has been reflected in a surge in research on the topic and the development of novel interventions. However, there is still further work to be done to secure its place on the agenda for survivorship care

planning. Two recent global reports recognised it as an important issue contributing to the development of mood disturbance among cancer survivors, and suggested further exploration was required to determine when it becomes a clinically significant issue [93-94]. However, neither of these reports produced any specific recommendations in terms of identifying and responding to FOR.

With the challenges around defining and measuring FOR, as well as engaging patients in conversations around the topic, there is much to be done before screening and interventions can be implemented within clinical settings. However, it is important that consideration be given around how such developments could eventually be integrated into cancer care within the UK. It could be argued that specialist oncology services may have the most expertise and be the most appropriate setting to address needs around FOR. On the other hand, once patients leave the routine cancer follow up system it is generally primary care services who are the gatekeepers of and providers of care. This issue is discussed in a recent interesting paper by [95], where it is suggested that patients themselves have expressed a wish for issues such as FOR to be discussed and supported via primary care services. Although this paper presents an American perspective on the issue, it raises important questions to be discussed.

Summary and Conclusions

The main aim of this study was to explore the role of psychological flexibility in mediating the relationship between FOR and adjustment difficulties (distress and QOL). It was hypothesised that for individuals with increased levels of FOR, relating to their fears with less psychological flexibility would lead to increased levels of distress and reduced QOL. The secondary aim of the study was to investigate the relative performance of an overall measure of psychological flexibility versus process level measurement in predicting these relationships.

In summary, results do not support the hypothesis that the direct relationship observed between FOR and distress and QOL is mediated by levels of psychological flexibility. However, two of the individual processes measured within the concept

of psychological flexibility, fusion to thoughts and valued living, did significantly mediate these relationships. In other words, FOR appears to lead, in part, to poorer outcomes via its influence on increased fusion to thoughts, and decreased living in accordance with values. Whilst overall, these findings do not specifically offer support to the application of the psychological flexibility model within interventions in cancer survivorship, they do highlight the potential benefit of considering the way in which individuals relate to their thoughts as an important avenue for the development of screening and targeting of interventions. Specifically, successful interventions may be aimed at helping individuals develop a less fused relationship with their FOR and promoting value based behaviour. Further longitudinal studies would be helpful to test the replicability of these findings, with larger samples of mixed cancer patients. One such study which is currently ongoing [87] may take an important further step towards the successful of targeted effective acceptance-based interventions to help people live well following cancer treatment.

References for Empirical Study

1. Cancer Research UK <http://www.cancerresearchuk.org/health-professional/cancer-statistics/survival>. Accessed 1st June 2017.
2. Simonelli LE, Siegel SD, Duffy NM. Fear of cancer recurrence: a theoretical review and its relevance for clinical presentation and management. *Psycho-oncology*. 2016. doi: 10.1002/pon.
3. Turton P, Cooke H. Meeting the needs of people with cancer for support and self-management. *Contemporary Therapies in Nursing & Midwifery*. 2000; 6: 130-137.
4. Costanzo ES, Lutgendorf SK, Mattes ML, Trehan S, Robinson CB, Tewfik F, et al. Adjusting to life after treatment: distress and quality of life following treatment for breast cancer. *British Journal of Cancer*. 2007; 97: 1625-1631.
5. Stanton A L, Ganz PA, Rowland JH, Meyerowitz BE, Krupnick JL & Sears SR. Promoting Adjustment after Treatment for Cancer. *Cancer Supplement*. 2005; 104(11): 2609-2613.
6. Knobf MT. Clinical Update: Psychosocial Responses in Breast Cancer Survivors. *Seminars in Oncology Nursing*. 2011; 27(3): e1-e14.
7. Bennett JA, Cameron LD, Brown PM, Whitehead LC, Porter D, Ottaway-Parkes T, et al. Time Since Diagnosis as a Predictor of Symptoms, Depression, Cognition, Social Concerns, Perceived Benefits, and Overall Health in Cancer Survivors. *Oncology Nursing Forum*. 2010; 37(3).
8. Stanton AL. What Happens Now? Psychosocial Care for Cancer Survivors after Medical Treatment Completion. *Journal of Clinical Oncology*. 2012; 30(11): 1215-1220.
9. Institute of Medicine and National Research Council. From Cancer Patient to Cancer Survivor: Lost in Transition. Washington DC: The National Academies Press. 2005.

10. The Scottish Government. Transforming Care After Treatment (TCAT). 2013. www.scotland.gov.uk/Topics/Health/Services/Cancer/TCAT. Accessed February 2014.
11. National Institute for Clinical Excellence (NICE). Improving supportive and palliative care for adults with cancer: Cancer service guideline [CSG4]. March 2004. <https://www.nice.org.uk/guidance/csg4>. Accessed 18th April 2017.
12. Baker F, Denniston M, Smith T & West MM. Adult Cancer Survivors: How are they faring? *Cancer (Suppl.)*. 2005;104(11): 2565-2576.
13. Lebel S, Ozakinci G, Humphris G, Mutsaers B, Thewes B, Prins J, et al. From normal response to clinical problem: definition and clinical features of fear of cancer recurrence. *Support Care Cancer*. 2016; 24: 3265-3268. doi: 10.1007/s00520-016-3272-5.
14. Crist JV & Grunfield EA. Factors reported to influence fear of recurrence in cancer patients: a systematic review. 2013. *Psycho-Oncology*; 22: 978-986.
15. Humphris GM, Rogers S, McNally D, Lee-Jones C, Brown J & Vaughan D. Fear of recurrence and possible cases of anxiety and depression in orofacial cancer patients. *International Journal of Oral and Maxillofacial Surgery*. 2003; 32(5): 486-491.
16. Koch L, Bertram H, Eberle A, Holleczeck B, Schmid-Hopfner S, Waldmann A, et al. Fear of recurrence in long-term breast cancer survivors—still an issue. Results on prevalence, determinants, and the association with quality of life and depression from the Cancer Survivorship—a multi-regional population based study. *Psycho-Oncology*. 2014; 23: 547-554.
17. Skaali T, Fossa SD, Bremnes R, Dahl O, Haaland CF, Hauge ER, et al. Fear of recurrence in long-term testicular cancer survivors. *Psycho-Oncology*. 2009; 18: 580-588.
18. Allen JD, Savadatti S, Levy AG. The transition from breast cancer 'patient' to 'survivor'. *Psycho-Oncology*. 2009; 18: 71-78.

19. Forrester K. "Normal's different for me now": a qualitative study of women's experiences of ending treatment for breast cancer. Unpublished Doctoral Thesis, University of Edinburgh. 2008.
20. Lauver DR, Connolly-Nelson K, Vang P. Stressors and Coping Strategies among Female Cancer Survivors after Treatments. *Cancer Nursing*. 2007; 30(2): 101-111.
21. Simard S, Thewes B, Humphris G, Dixon M, Hayden C, Mireskandari S, et al. Fear of cancer recurrence in adult cancer survivors: a systematic review of quantitative studies. *J Cancer Surviv*. 2013; 7(3): 300-322. doi: 10.1007/s11764-013-0272-z.
22. Lee-Jones C, Humphris G, Dixon R, Hatcher MB. Fear of cancer recurrence—a literature review and proposed cognitive formulation to explain exacerbation of recurrence fears. *Psycho-Oncology*. 1997;6(2):95–105.
23. Butow P, Kelly S, Thewes B, Hruby G, Sharpe L, Beith J. Attentional bias and metacognitions in cancer survivors with high fear of cancer recurrence. *Psycho-Oncology*. 2015;24(4):416–423. DOI:10.1002/pon.3659.
24. Mishel MH. Uncertainty in Illness. *The Journal of Nursing Scholarship*. 1988;20(4):225–232.
25. Lepore SJ. A social-cognitive processing model of emotional adjustment to cancer. *Psychological Interventions for Cancer*. 2001; 6: 99–118. DOI:10.1037/10402-006.
26. Mellon S, Kershaw TS, Northouse LL, Freeman-Gibb L. A family-based model to predict fear of recurrence for cancer survivors and their caregivers. *Psycho-Oncology*. 2007;16(3):214–223.
27. Yalom ID. *Existential Psychotherapy*, Basic Books, Inc: New York, NY, 1980.
28. Simard S, Savard J, & Ivers H. Fear of cancer recurrence: specific profiles and nature of intrusive thoughts. *Journal of Cancer Survivorship*. 2010; 4, 361-371.
29. Myers SB, Manne SL, Kissane DW, Ozga M, Kashy DA, Rubin S, et al. Social-cognitive processes associated with fear of recurrence among women newly

- diagnosed with gynaecological cancers. *Gynaecologic Oncology*. 2013; 128: 120-127.
30. Thewes B, Butow P, Zachariae R, Christensen S, Simard S, & Gotay C. Fear of cancer recurrence: a systematic literature review of self-report measures. *Psycho-Oncology*. 2012; 21: 571-587.
 31. Armes J, Crowe M, Colbourne L, Morgan H, Murrells T, Oakley C, et al. Patients' Supportive Care Needs Beyond the End of Cancer Treatment: A Prospective, Longitudinal Survey. *Journal of Clinical Oncology*. 2009; 27(36): 6172-6179.
 32. Lobb EA, Joske D, Butow P, Kristjanson LJ, Cannell P, Cull G, et al. When the safety net of treatment has been removed: Patient's unmet needs at the completion of treatment for haematological malignancies. *Patient Education and Counseling*. 2009; 77: 103-108.
 33. Dawson G, Madsen LT, Dains JE. Interventions to Manage Uncertainty and Fear of Recurrence in Female Breast Cancer Survivors: A Review of the Literature. *Clinical Journal of Oncology*. 2016; 20(6): E155-E161.
 34. Hayes SC, Strosahl KD, Wilson KG. *Acceptance and commitment therapy: The process and practice of mindful change* (2nd edition). New York, NY: The Guilford Press. 2012.
 35. Hayes SC, Luoma JB, Bond FW, Masuda A, Lillis J. *Acceptance and Commitment Therapy: Model, processes and outcomes*. *Behaviour Research and Therapy*. 2006; 44: 1-25.
 36. Harris R. *Embracing Your Demons: An Overview of Acceptance and Commitment Therapy*. *Psychotherapy in Australia*. 2006; 12(4): 2-8.
 37. Hayes SC, Strosahl KD, Bunting K, Twohig M, Wilson KG. What is acceptance and commitment therapy? In S. C. Hayes & K. D. Strosahl (Eds.), *A practical guide to acceptance and commitment therapy* (pp. 1-30). New York: Springer. 2004.

38. Scott W, McCracken LM, Trost Z. A psychological flexibility conceptualisation of the experience of injustice among individuals with chronic pain. *British Journal of Pain*. 2014; 8(2): 62-71.
39. Vowles KE, McCracken LM. Acceptance and values-based action in chronic pain: A study of treatment effectiveness and process. *Journal of Consulting and Clinical Psychology*. 2008; 76: 397-407.
40. Ferreira N. Investigating the role of psychological flexibility and the use of an acceptance and commitment therapy based intervention in irritable bowel syndrome. Unpublished Doctoral Thesis, University of Edinburgh. 2011.
41. Westin V, Hayes SC, Andersson G. Is it the sound or your relationship to it? The role of acceptance in predicting tinnitus impact. *Behaviour Research and Therapy*. 2008; 46(12): 1259-1265.
42. Garland EL, Thielking P, Thomas EA, Coombs M, White S, Lombardi J, et al. Linking dispositional mindfulness and positive psychological processes in cancer survivorship: a multivariate path analytic test of the mindfulness-to-meaning theory. *Psycho-oncology*. 2016. doi: 10.1002/pon.
43. Ciarrochi J, Fisher D, Lane L. The link between value motives, value success, and well-being among people diagnosed with cancer. *Psycho-Oncology*. 2011; 20: 1184-1192.
44. Gillanders DT, Sinclair AK, MacLean M, Jardine K. Illness cognitions, cognitive fusion, avoidance and self-compassion as predictors of distress and quality of life in a heterogeneous sample of adults, after cancer. *Journal of Contextual Behavioral Science*. 2015: 1–12. doi.org/10.1016/j.jcbs.2015.07.003.
45. Angiola JE, Bowen AM. Quality of Life in Advanced Cancer: An Acceptance and Commitment Therapy View. *The Counseling Psychologist*. 2013; 41: 313-335.
46. Feros D, Lane L, Ciarrochi J, Blackledge JT. Acceptance and Commitment Therapy (ACT) for improving the lives of cancer patients: a preliminary study. *Psycho-Oncology*. 2013; 22: 459-464.

47. Rost AD, Wilson K, Buchanan E, Hildebrandt MJ, Mutch D. Improving Psychological Adjustment among Late-Stage Ovarian Cancer Patients: Examining the Role of Avoidance in Treatment. *Cognitive and Behavioral Practice*. 2012; 19: 508-517.
48. Shumay D, Fujiye MT, Berman M, Gregg J, Melisko M, Dunn L. WiLLoW: An Acceptance and Commitment Therapy Intervention for Breast Cancer Survivors to address Anxiety, Worry and Fear of Cancer Recurrence. *Psycho-Oncology*. 2013; 22(Suppl.2): 26-27.
49. Hulbert-Williams N, Swash B, Storey L. Exploring the Acceptability of a Brief Acceptance and Commitment Therapy (ACT) Intervention for Cancer Survivors. *Psycho-Oncology*. 2014; 23 (Suppl. 3): 65–168. doi: 10.1111/j.1099-1611.2014.3694.
50. Thewes B, Brebach R, Dzidowska M, Rhodes P, Sharpe L, Butow P. Current approaches to managing fear of cancer recurrence; a descriptive survey of psychosocial and clinical health professionals. *Psycho-Oncology*. 2014; 23: 390-396.
51. Davies NJ, Batehup L. Towards a personalised approach to aftercare: a review of cancer follow-up in the UK. *J Cancer Surviv*. 2011; 5: 142-151. doi: 10.1007/s11764-010-0165-3.
52. Emery K. So You Want to Do an Online Study: Ethics Considerations and Lessons Learned. *Ethics & Behavior*. 2014; 24(4): 293-303.
53. Gosling SD, Vazire S, Srivastava S, John OP. Should We Trust Web-Based Studies? A Comparative Analysis of Six Preconceptions about Internet Questionnaires. *American Psychologist*. 2004; 99(2): 93-104.
54. Gillanders DT, Bolderston H, Bond FW, Dempster M, Flaxman PE, Campbell L, et al. The Development and Initial Validation of the Cognitive Fusion Questionnaire. *Behavior Therapy*. 2014; 45: 83-101.
55. Lebel S, Maheu C, Levebre M, Secord S, Courbasson C, Singh M, et al. Addressing fear of recurrence among women with cancer: a feasibility and

- preliminary outcome study. *J Cancer Surviv.* 2014; 8: 485-496. doi: 10.1007/s11764-014-0357-3.
56. Simard S, Savard J. Fear of Cancer Recurrence Inventory: development and initial validation of a multidimensional measure of fear of cancer recurrence. *Supportive Cancer Care.* 2009; 17: 241-251.
 57. Costa DSJ. Screening for clinical levels of fear of cancer recurrence. *Psycho-oncology.* 2017; 1-2. doi: 10.1002/pon.4390.
 58. Bond FW, Hayes SC, Baer RA, Carpenter KM, Guenole N, Orcutt HK, et al. Preliminary Psychometric Properties of the Acceptance and Action Questionnaire-II: A Revised Measure of Psychological Inflexibility and Experiential Avoidance. *Behavior Therapy.* 2011; 42: 676-688.
 59. Gamez W, Chmielewski M, Kotov R, Ruggero C, Suzuki N, Watson D. The Brief Experiential Avoidance Questionnaire: Development and Initial Validation. *Psychological Assessment.* 2014; 26(1): 35-45.
 60. Trompetter HR, ten Klooster PM, Schreurs KMG, Fledderus M, Westerhof GJ, Bohlmeijer ET. Measuring Values and Committed Action with the Engaged Living Scale (ELS): Psychometric Evaluation in a Nonclinical Sample and a Chronic Pain Sample. *Psychological Assessment.* 2013; 25(4): 1235-1246.
 61. Brown KW, Ryan RM. The benefits of being present: Mindfulness and its role in psychological wellbeing. *Journal of Personality and Social Psychology.* 2003; 84 (4): 822-848.
 62. Carlson LE, Brown KW. Validation of the Mindful Attention Awareness Scale in a cancer population. *Journal of Psychosomatic Research.* 2005; 58, 29-33.
 63. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica.* 1983; 67(6): 361-370.
 64. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The Validity of the Hospital Anxiety and Depression Scale. An Updated Literature Review. *Journal of Psychosomatic Research.* 2002; 52(2): 69-77.

65. Cella DF, Tulsky DS, Gray G, Sarafian B, Linn E, Bonomi A, et al. The Functional Assessment of Cancer Therapy scale: development and validation of the general measure. *Journal of Clinical Oncology*. 1993; 11(3): 570-579.
66. Webster K, Cella D, Yost K. The Functional Assessment of Chronic Illness Therapy (FACIT) Measurement System: properties, applications, and interpretation. *Health and Quality of Life Outcomes*. 2003; 1(79).
67. Faul F, Erdfelder E, Lang AG, Buchner A. G*POWER 3: A flexible statistical power analysis program for the social, behavioural and biomedical sciences. *Behaviour Research Methods*. 2007; 39(2): 175-191.
68. Little RJA. A Test of Missing Completely at Random for Multivariate Data with Missing Values. *Journal of the American Statistical Association*. 1988; 83(404): 1198-1202.
69. Enders CK. Analyzing Longitudinal Data with Missing Values. *Rehabilitation Psychology*. 2011; 56(4): 267-288.
70. Fox-Wasylyshyn SM, El-Masri MM. Focus on Research Methods: Handling Missing Data in Self-Report Measures. *Research in Nursing & Health*. 2005; 28: 488-495.
71. Hoaglin DC, Iglewicz B. Fine-Tuning Some Resistant Rules for Outlier Labelling. *Journal of the American Statistical Association*. 1987; 82(400): 1147-1149.
72. Field A. *Discovering Statistics Using IBM SPSS Statistics*. 4th Edition. Sage Publications. London. 2013.
73. Brucker PS, Yost K, Cashy J, Webster K, Cella D. General Population and Cancer Patient Norms for the Functional Assessment of Cancer Therapy – General (FACT-G). *Evaluation & the Health Professions*. 2005; 28(2): 192-211.
74. Holzner B, Kemmler G, Cella D, De Paoli C, Meraner V, Kopp M, et al. Normative data for functional assessment of cancer therapy General scale and its use for the interpretation of quality of life scores in cancer survivors. *Acta Oncologica*. 2004; 43(2): 153-160.

75. Mitchell AJ, Meader N, Symonds P. Diagnostic validity of the Hospital Anxiety and Depression Scale (HADS) in cancer and palliative settings: a meta-analysis. *J Affect Disord.* 2010; 126(3): 335-48. doi: 10.1016/j.jad.2010.01.067.
76. Breeman S, Cotton S, Fielding S, Jones GT. Normative data for the Hospital Anxiety and Depression Scale. *Qual Life Res.* 2015; 24(2): 391-8. doi: 10.1007/s11136-014-0763-z.
77. Osborne RH, Elsworth GR, Hopper JL. Age-specific norms and determinants of anxiety and depression in 731 women with breast cancer recruited through a population-based cancer registry. *European Journal of Cancer Care.* 2003; 39: 755-762.
78. Haynes SN, Lench HC. Incremental Validity of New Clinical Assessment Measures. *Psychological Assessment.* 2003; 15(4): 456-466.
79. Hayes AF. *Introduction to Mediation, Moderation and Conditional Process Analysis: A regression based approach.* New York: Guildford Press. 2013.
80. Hulbert-Williams NJ, Storey L. Psychological flexibility correlates with patient-reported outcomes independent of clinical or sociodemographic characteristics. *Support Care Cancer.* 2016; 24: 2513-2521. doi: 10.1007/s00520-015-3050-9.
81. Jensen CG, Elsass P, Neustrup P, Bihal T, Flyger H, Kay SM, et al. What to listen for in the consultation. Breast cancer patients' own focus on talking about acceptance-based psychological coping predicts decreased psychological distress and depression. *Patient Education and Counselling.* 2014; 97(2): 165-172. doi: 10.1016/j.pec.2014.07.020.
82. Simard S, Savard J, Ivers H. Fear of cancer recurrence: specific profiles and nature of intrusive thoughts. *J Cancer Surviv.* 2010; 4: 361-371. doi: 10.1007/s11764-010-0136-8.
83. Myers SB, Manne SL, Kissane DW, Ozga M, Kashy DA, Rubin S, et al. Social-cognitive processes associated with fear of recurrence among women newly

- diagnosed with gynaecological cancers. *Gynaecologic Oncology*. 2013; 128: 120-127.
84. Savard J, Ivers H. The evolution of fear of cancer recurrence during the cancer care trajectory and its relationship with cancer characteristics. *Journal of Psychosomatic Research*. 2013; 74: 354-360.
 85. Taylor TR, Huntley ED, Sween J, Makambi K, Mellman TA, Williams CA, et al. An Exploratory Analysis of Fear of Recurrence among African-American Breast Cancer Survivors. *International Journal of Behavioral Medicine*. 2012; 19(3): 280-287.
 86. Thewes B, Bell ML, Butow P, Beith J, Boyle F, Friedlander M, et al. Psychological morbidity and stress but not social factors influence level of fear of cancer recurrence in young women with early breast cancer: results of a cross-sectional study. 2013; 22(12): 2797-2806. doi: 10.1002/pon.3348.
 87. Hulbert-Williams N, Pilkington M, Swash B, Storey L. Psychological transition after primary cancer treatment: Component mapping using Acceptance and Commitment Therapy for effective intervention development. *Psycho-oncology*. 2016; 25(S3):71.
 88. Costa DSJ, Smith AB, Fardell JE. The sum of all fears: conceptual challenges with measuring fear of cancer recurrence. *Support Care Cancer*. 2016; 24: 1-3. doi: 10.1007/s00520-015-2943-y.
 89. Walters SJ, Henriques-Cadby IBdA, Bortolami O, Flight L, Hind D, Jacques RM, et al. Recruitment and retention of participants in randomised controlled trials: a review of trials funded and published by the United Kingdom Health Technology Assessment Programme. *BMJ Open*. 2017; 7: e015276. doi: 10.1136/bmjopen-2016-015276.
 90. MacMillan Cancer Support. Treatment Summary. A tool to improve communication between cancer services and primary care. http://www.macmillan.org.uk/documents/aboutus/health_professionals/recoverypackage/treatmentsummary.pdf. Accessed on 2nd June 2017.
 91. Feurstein M. Defining cancer survivorship. *J Cancer Surviv*. 2007; 1: 5-7.

92. Lebel S, Ozakinci G, Humphris G, Thewes B, Prins B. Current state and future prospects of research on fear of cancer recurrence. *Psycho-oncology*. 2016. doi: 10.1002/pon.4103.
93. Ganz PA, Yip CH, Gralow JR, Distelhorst SR, Albain KS, Anderson BL, et al. Supportive care after curative treatment for breast cancer (survivorship care): Resource allocations in low-and middle-income countries. A Breast Health Global Initiative 2013 consensus statement. *The Breast*. 2013: 606-615.
94. Runowicz CD, Leach CR, Henry NL, Henry KS, Mackey HT, Cowens-Alvarado RL, et al. American Cancer Society/American Society of Clinical Oncology Breast Cancer Survivorship Care Guideline. *Journal of Clinical Oncology*. 2016; 34(6). doi:10.1200/JCO.2015.64.3809.
95. Mayer DK, Nasso SF, Earp JA. Defining cancer survivors, their needs, and perspectives on survivorship health care in the USA. *Cancer survivorship in the USA 1. Lancet Oncology*. 2017; 18: e11-e18.

Overall Thesis Portfolio References

1. Krebber AMH, Buffart LM, Kleijn G, Riepma IC, de Bree R, Leemans CR, et al. Prevalence of depression in cancer patients: a meta-analysis of diagnostic interviews and self-report instruments. *Psycho-oncology*. 2014; 23: 121-130.
2. Mehnert A, Bruhler E, Faller H, Hurter M, Keller M, Schulz H, et al. Four-Week Prevalence of Mental Disorders in Patients with Cancer Across Major Tumour Entities. 2014; 32(31): doi: 10.1200/JCO.2014.56.0086.
3. MacMillan Cancer Support. Worried sick: The emotional impact of cancer. April 2006.
4. Kingston T, Collier S, Hevey D, McCormick MM, Besani C, Cooney J, et al. Mindfulness-based cognitive therapy for psycho-oncology patients: an exploratory study. *Irish Journal of Psychological Medicine*. 2015; 32: 265-274. doi:10.1017/ipm.2014.81.
5. Mitchell AJ, Ferguson DW, Gill J, Paul J, Symonds P. Depression and anxiety in long-term cancer survivors compared with spouses and healthy controls: a systematic review and meta-analysis. *Lancet Oncology*. 2013; 14: 721-32. doi: dx.doi.org/10.1016/ S1470-2045(13)70244-4.
6. Mitchell AJ, Chan M, Bhatti H, Halton M, Grassi L, Johansen C, et al. Prevalence of depression, anxiety, and adjustment disorder in oncological, haematological, and palliative-care settings: a meta-analysis of 94 interview based studies. *Lancet Oncology*. 2011; 12: 160-74. doi:10.1016/S14702045(11)70002-X.
7. Matthews H, Grunfield EA, Turner A. The efficacy of interventions to improve psychosocial outcomes following surgical treatment for breast cancer: a systematic review and meta-analysis. 2015: 1-15. doi: 10.1002/pon.4199.

8. Parahoo K, McDonough S, McCaughan E, Noyes J, Semple C, Halstead EJ. Psychosocial interventions for men with prostate cancer: a Cochrane systematic review. *BJU Int.* 2015; 116: 174-183. doi:10.1111/bju.12989.
9. Newell SA, Sanson-Fisher RW, Savolainen NJ. For the NSW Cancer Council Cancer Education Research Program. Systematic Review of Psychological Therapies for Cancer Patients: Overview and Recommendations for Future Research. *Journal of the National Cancer Institute.* 2002; 94(8): 558-584.
10. Osborn RL, Demoncada AC, Feuerstein M. Psychosocial interventions for depression, anxiety and quality of life in cancer survivors: meta-analyses. *Int'l J. Psychiatry in Medicine.* 2006; 36(1): 13-34.
11. Faller H, Schuler M, Richard M, Heckl U, Weis J, Kuffner R. Effects of Psycho-Oncologic Interventions on Emotional Distress and Quality of Life in Adult Patients with Cancer: Systematic Review and Meta-Analysis. *Journal of Clinical Oncology.* 2013; 31(6): 782-793. doi: 10.1200/JCO.2011.40.8922.
12. Phillips JL, Currow DC. Cancer as a chronic disease. *Collegian.* 2010; 17(2): 47-50.
13. Rowland JH. Cancer Survivorship: Rethinking the Cancer Control Continuum. *Seminars in Oncology Nursing.* 2008; 24(3): 145-152.
14. Mehta RD, Roth AJ. Psychiatric Considerations in the Oncology Setting. CA: A Cancer Journal for Clinicians. 2015. doi: 10.3322/caac.21285.
15. Hayes SC, Luoma JB, Bond FW, Masuda A, Lillis J. Acceptance and Commitment Therapy: Model, processes and outcomes. *Behaviour Research and Therapy.* 2006; 44: 1-25.
16. Carlson LE. Mindfulness-based interventions for coping with cancer. *Ann. N. Y. Acad. Sci.* 2016; 1373: 5-12. doi: 10.1111/nyas.13029.
17. Kabat-Zinn J. Mindfulness-Based Interventions in Context: Past, Present and Future. *Clin Psychol Sci Prac.* 2003; 10: doi: 144-156. 10.1093/clipsy/bpg01.
18. Bishop SR, Lau M, Shaprio S, Carlson L, Anderson ND, Carmody J, et al. Mindfulness: A Proposed Operational Definition. *Clin Psychol Sci Prac.* 2004; 11: 230-241. doi: 10.1093/clipsy/bph077.

19. Hofman SG, Sawyer AT, Fang A, Asnaani A. Emotion dysregulation model of mood and anxiety disorders. *Depression and Anxiety*. 2012; 29: 409-416.
20. Khourey B, Lecomte T, Fortin G, Masse M, Therien P, Bouchard V, et al. Mindfulness-based therapy: A comprehensive meta-analysis. *Clinical Psychology Review*. 2013; 33: 763-771.
21. Kabat-Zinn J, Massion AO, Kristeller J, Peterson LG, Fletcher KE, Pbert L, et al. Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *Am J Psychiatry*. 1992;149(7):936–943.
22. Grossman P, Niemann L, Schmidt S, Walach H. Mindfulness-based stress reduction and health benefits. A meta-analysis. *Journal of Psychosomatic Research*. 2004; 57: 35-43. doi: 10.1016/S0022-3999(03)00573-7.
23. Carlson LE, Speca M, Segal Z. Mindfulness-based cancer recovery. A step-by-step MBSR approach to help you cope with treatment and reclaim your life. New Harbinger Publications. Oakland CA. 2010.
24. Matchim Y, Armer JM, Stewart BR. Mindfulness-Based Stress Reduction Among Breast Cancer Survivors: A Literature Review and Discussion. *Oncology Nursing Forum*. 2011; 38(2): E61-E71.
25. Cramer H, Lauche R, Paul A, Dobos G. Mindfulness-based stress reduction for breast cancer – a systematic review and met-analysis. *Curr Oncol*. 2012; 19(5): e343-e352.
26. Zainal NZ, Booth S, Huppert FA. The efficacy mindfulness-based stress reduction on mental health of breast cancer patients: a meta-analysis. *Psycho-oncology*. 2013; 22: 1457-1465. doi: 10.1002/pon.3171.
27. Shennan C, Payne S, Fenlon D. What is the evidence for the use of mindfulness-based interventions in cancer care? A review. *Psycho-oncology*. 2011; 20: 681-697. doi: 10.1002/pon.1819.
28. Ledesma D, Kumano H. Mindfulness-based stress reduction and cancer: a meta-analysis. *Psycho-oncology*. 2009; 18: 571-579. doi: 10.1002/pon.1400.

29. Musial F, Bussing A, Heusser P, Choi K-E, Ostermann T. Mindfulness-Based Stress Reduction for Integrative Cancer Care – a Summary of Evidence. *Forsch Komplementmed*. 2011; 18: 192-202. doi: 10.1159/000330714.
30. Piet J, Wurtzen H, Zachariae R. The Effect of Mindfulness-Based Therapy on Symptoms of Anxiety and Depression in Adult Cancer Patients and Survivors: A Systematic Review and Meta-Analysis. *Journal of Consulting Clinical Psychology*. 2012; 80(6): 1007-1020. doi: 10.1037/a0028329.
31. Zhang MF, Wen YS, Liu WY, Peng LF, Wu XD, Liu QW. Effectiveness of Mindfulness-based Therapy for Reducing Anxiety and Depression in Patients with Cancer. A Meta-Analysis. *Medicine*. 2015; 94(45). doi: 10.1097/MD.0000000000000897.
32. Turton P, Cooke H. Meeting the needs of people with cancer for support and self-management. *Contemporary Therapies in Nursing & Midwifery*. 2000; 6: 130-137.
33. Costanzo ES, Lutgendorf SK, Mattes ML, Trehan S, Robinson CB, Tewfik F, et al. Adjusting to life after treatment: distress and quality of life following treatment for breast cancer. *British Journal of Cancer*. 2007; 97: 1625-1631.
34. Stanton A L, Ganz PA, Rowland JH, Meyerowitz BE, Krupnick JL & Sears SR. Promoting Adjustment after Treatment for Cancer. *Cancer Supplement*. 2005; 104(11): 2609-2613.
35. Reynolds LM, Bissett IP, Porter D, Considine NS. A Brief Mindfulness Intervention is Associated with Negative Outcomes in a Randomised Controlled Trial Among Chemotherapy Patients. *Mindfulness*. 2017. doi: 10.1007/s12671-017-0705-2.
36. Hansen NB, Lambert MJ, Forman EM. The Psychotherapy Dose-Response Effect and Its Implications for Treatment Delivery Services. *Clin Psychol Sci Prac*. 2002; 9: 329-343.
37. Bower P, Gilbody S. Stepped care in psychological therapies: access, effectiveness and efficiency. Narrative literature review. *The British Journal of Psychiatry*. 2005; 186(1): 11-17.

38. Rouleau CR, Garland SN, Carlson LE. The impact of mindfulness-based interventions on symptom burden, positive psychological outcomes, and biomarkers in cancer patients. *Cancer Management and Research*. 2015; 7: 121-131. doi:org/10.2147/CMAR.S64165.
39. Moher D, Shamseer L, Clarke M, Gherzi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*. 2015; 4(1). doi: org/10.1186/2046-4053-4-1.
40. Higgins JPT, Green S. *Cochrane Handbook for Systematic Reviews of Interventions*. The Cochrane Collaboration. Version 5.1.0. 2011. Accessed online at <http://handbook-5-1.cochrane.org/> on 10th February 2017.
41. Hewitt M, Greenfield S, Stovall E. *From Cancer Patient to Cancer Survivor. Lost in Transition*. Committee on Cancer Survivorship: Improving Cancer Care and Quality of Life National Cancer Policy Board. Institute of Medicine and National Research Council of the National Academies. The National Academic Press. Washington DC. 2006.
42. National Coalition for Cancer Survivorship.
<https://www.canceradvocacy.org/about-us/our-mission/>. Accessed 15th April 2017.
43. National Cancer Institute.
<https://www.cancer.gov/publications/dictionaries/cancer-terms?cdrid=445089>. Accessed 15th April 2017.
44. Hayes SC, Villatte M, Levin M, Hildebrandt M. Open, Aware and Active: Contextual Approaches as an Emerging Trend in the Behavioral and Cognitive Therapies. *Annu Rev Clin Psychol*. 2011; 7: 141-68. doi: 10.1146/annurev-clinpsy-032210-104449.
45. Higgins JPT, Altman DG, Gotzsche PC, Juni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ*. 2011; 343: d5928. doi: org/10.1136/bmj.d5928.

46. Scottish Intercollegiate Guidelines Network. SIGN 50. A guideline developer's handbook. Revised edition. 2011.
47. Jüni P, Altman DG, Egger M. Assessing the quality of randomised controlled trials. In *Systematic Reviews in Health Care: Meta-analysis in Context*, Egger M, Smith GD, Altman DG (eds.). BMJ Publishing Group: London, England, 2001; 87–108.
48. Barendregt JJ, Doi SA. MetaXL User Guide. EpiGear International Pty Ltd. Australia. 2011-2016.
49. Doi SA, Barendregt JJ, Khan S, Thalib L, Williams GM. Advances in the Meta-analysis of heterogeneous clinical trials II: The quality effects model. *Contemp Clin Trials* 2015, 45:123-129.
50. Borenstein M, Hedges LV, Higgins JPT, Rothstein HR. *Introduction to Meta-Analysis*. John Wiley & Sons Ltd. 2009.
51. Cohen J. The statistical power of abnormal-social psychological research: A review. *Journal of Abnormal and Social Psychology*. 1962; 65: 145-153.
52. Carlson LE, Doll R, Stephen J, Faris P, Tamawanga R, Drysdale et al. Randomized Controlled Trial of Mindfulness-Based Cancer Recovery Versus Supportive Expressive Therapy for Distressed Survivors of Breast Cancer (MINDSET). *Journal of Clinical Oncology*. 2013; 31(25): 3119-3127. doi: 10.1200/JCO.2012.47.5210.
53. Sarenmalm EK, Martensson LB, Andersson BA, Karlsson P, Bergh I. Mindfulness and its efficacy for psychological and biological responses in women with breast cancer. *Cancer Medicine*. 2017; 6(5): 1108-1122. doi: 10.1002/cam4.1052.
54. Higgins JPT, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ*. 2003; 327(7414): 557-560. doi: <https://doi.org/10.1136/bmj.327.7414.557>.
55. Egger M, Smith GD, Minder C. Bias in meta-analyses detected by a simple, graphical test. *BMJ*. 1997; 315: 629. doi: <https://doi.org/10.1136/bmj.315.7109.629>.

56. Blaes AH, Fenner D, Bachanova V, Torkelson C, Geller M, Haddad T, et al. Mindfulness-based cancer recovery in survivors recovering from chemotherapy and radiation. *The Journal of Community and Supportive Oncology*. 2016; 14(8): 351-358. doi: 10.12788/jcso.0244.
57. Bower JE, Crosswell AD, Stanton AL, Crespi CM, Winston D, Arevalo J, et al. Mindfulness Meditation for Younger Breast Cancer Survivors: A Randomized Controlled Trial. *Cancer*. 2015: 1231- 1240. doi: DOI: 10.1002/cncr.29194.
58. Boyle CC, Stanton AL, Ganz PA, Crespi CM, Bower JE. Improvements in Emotion Regulation Following Mindfulness Meditation: Effects on Depressive Symptoms and Perceived Stress in Younger Breast Cancer Survivors. *Journal of Consulting and Clinical Psychology*. 2017; 85(4): 397-402.
59. Branstrom R, Kvillemo P, Brandberg Y, Moskowitz JT. Self-report mindfulness as a Mediator of Psychological Well-being in a Stress Reduction intervention for Cancer Patients – A Randomized Study. *Ann behav med*. 2010; 39: 151-161. doi: 10.1007/s12160-010-9168-6.
60. Schellekens MPJ, Tamawanga R, Labelle LE, Specia M, Stephen J, Drysdale E, et al. Mindfulness-Based Cancer Recovery (MBCR) versus Supportive Expressive Group Therapy (SET) for distressed breast cancer survivors: evaluating mindfulness and social support as mediators. *J Behav Med*. 2017; 40: 414-422. doi: 10.1007/s10865-016-9799-6.
61. Hoffman CJ, Ersser SJ, Hopkinson JB, Nicholls PG, Harrington JE, Thomas PW. Effectiveness of Mindfulness-Based Stress Reduction in Mood, Breast- and Endocrine-Related Quality of Life, and Well-being in Stage 0 to III Breast Cancer: A Randomized, Controlled Trial. *Journal of Clinical Oncology*. 2012; 30(12): 1335-1342. doi: 10.1200/JCO.2010.34.0331.
62. Lengacher CA, Johnson-Mallard V, Post-White J, Moscso MS, Jacobson PB, Klein TW, et al. Randomized controlled trial of mindfulness-based stress

- reduction (MBSR) for survivors of breast cancer. *Psycho-oncology*. 2009; 18: 1261-1272. doi:10.1002/pon.152.
63. Lengacher CA, Shelton MM, Reich RR, Barta MK, Johnson-Mallard V, Moscoso MS, et al. Mindfulness-based stress reduction (MBSR(BC)) in breast cancer: evaluating fear of recurrence (FOR) as a mediator of psychological and physical symptoms in a randomized controlled trial (RCT). *J Behav Med*. 2014; 37: 185-195. doi: DOI 10.1007/s10865-012-9473-6.
 64. Lengacher CA, Reich RR, Paterson CL, Ramesar S, Park JY, Alinat C, et al. Examination of Broad Symptom Improvement Resulting from Mindfulness-Based Stress Reduction in Breast Cancer Survivors: A Randomized Controlled Trial. *Journal of Clinical Oncology*. 2016; 34(24): 2827-2835. doi: 10.1200/JCO.2015.65.7874.
 65. Zernicke KA, Campbell TS, Specia M, McCabe-Ruff K, Flowers S, Carlson LE. A Randomized Wait-List Controlled Trial of Feasibility and Efficacy of an Online Mindfulness-Based Cancer Recovery Program: The eTherapy for Cancer Applying Mindfulness Trial. *Psychosomatic Medicine*. 2014; 76: 257-267. 10.1097/PSY.0000000000000053.
 66. Crane-Okada R, Kiger H, Sugerman F, Uman GC, Shapiro SL, Wyman-McGinty W, Anderson NLR. Mindful Movement Program for Older Breast Cancer Survivors. A Pilot Study. *Cancer Nursing*. 2012; 35(4): E1-E13. doi: 10.1097/NCC.0b013e3182280f73.
 67. Dodds SE, Pace TWW, Bell ML, Fiero M, Negi LT, Raison CL, et al. Feasibility of Cognitively-Based Compassion Training for breast cancer survivors: a randomized, wait list controlled pilot study. *Support Care Cancer*. 2015; 23: 3599-3608. doi: 0.1097/NCC.0b013e3182280f73.
 68. National Comprehensive Cancer Network: NCCN Clinical Practice Guidelines in Oncology: NCCN Practice Guidelines for the Management of Psychosocial Distress.
http://www.nccn.org/professionals/physician_gls/f_guidelines.asp. Accessed on 5th May 2017.

69. Lambert SD, Pallant JF, Clover K, Britton B, King MT, Carter G. Using Rasch analysis to examine the distress thermometer's cut-off scores among a mixed group of patients with cancer. *Qual Life Res.* 2014; 23(8): 2257-65. doi: 10.2007/s11136-014-0673-0.
70. McNair DA, Lorr M, Droppelman LF. Profile of mood states. San Diego, CA. Educational and Industrial Testing Service. 1971.
71. Cassileith BR, Lusk EJ, Strouse TB, Miller DS, Brown LL, Cross PA. A psychological analysis of cancer patients and their next-of-kin. *Cancer.* 1985; 1(55): 72-6.
72. Curran SL, Andrykowski MA, Studts JL. Short Form of the Profile of Mood States (POMS-SF): Psychometric Information. *Psychological Assessment.* 1995; 7(1): 80-83.
73. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica.* 1983; 67(6): 361-370.
74. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica.* 1983; 67(6): 361-370.
75. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The Validity of the Hospital Anxiety and Depression Scale. An Updated Literature Review. *Journal of Psychosomatic Research.* 2002; 52(2): 69-77.
76. Spielberger CD, Gorsuch RL, Lushene RE. Manual for the State-trait Anxiety Inventory. Consulting Psychologists: Palo Alto, CA. 1983.
77. Spielberger CD, Vagg PR. Psychometric properties of the STAI: a reply to Ramanaiah, Franzen and Schill. *J Pers Assess.* 1984; 48: 95-97.
78. Radloff LS. The CES-D Scale. A Self-Report Depression Scale for Research in the General Population. *Applied Psychological Measurement.* 1977; 1(3): 385-401.
79. Hann D, Winter K, Jacobsen P. Measurement of depressive symptoms in cancer patients: evaluation of the Center for Epidemiological Studies Depression Scale (CES-D). *J Psychosom Res.* 1999; 46(5): 437-43.

80. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav.* 1983; 24(4): 385-396.
81. Roberti JW, Harrington LN, Storch EA. Further Psychometric Support for the 10-Item Version of the Perceived Stress Scale. *Journal of College Counseling.* 2006; 9(2): 135-147.
82. Carlson LE, Thomas BC. Development of the Calgary Symptoms of Stress Inventory (C-SOSI). *Int J Behav Med.* 2007; 14(4): 249-56.
83. Lebel S, Ozakinci G, Humphris G, Mutsaers B, Thewes B, Prins J, et al. From normal response to clinical problem: definition and clinical features of fear of cancer recurrence. *Support Care Cancer.* 2016; 24: 3265-3268. doi: 10.1007/s00520-016-3272-5.
84. Avis NE, Smith KW, McGraw S, Smith RG, Petronis VM, Carver CS. Assessing quality of life in adult cancer survivors (QLACS). *Qual Life Res.* 2005; 14(4): 1007-23.
85. Vickberg SM. The Concerns About Recurrence Scale (CARS): a systematic measure of women's fears about the possibility of breast cancer recurrence. *Ann Behav Med.* 2003; 25(1): 16-24.
86. Northouse LL. Mastectomy patients and the fear of cancer recurrence. *Cancer Nurs.* 1981; 4(3): 213-20.
87. Simard S, Savard J. Fear of Cancer Recurrence Inventory: Development and initial validation of a multidimensional measure of fear of cancer recurrence. *Support Care Cancer.* 2009; 17: 241-251. doi: 10.1007/s00520-008-0444-y.
88. Sundin EC, Horowitz MJ. Impact of Events Scale: Psychometric Properties. *Br J Psychiatry.* 2002; 180: 205-209.
89. Weiss DS, Marmar CR. The impact of events scale-revised. In: Wilson J, Keane TM (Eds). *Assessing psychological trauma and PTSD.* Guildford, New York, pp. 399-411. 1996.
90. Baer RA, Smith GT, Hopkins J, Krietemeyer J, Toney L. Using self-report assessment methods to explore facets of mindfulness. *Assessment.* 2006; 13: 27-45.

91. Brown KW, Ryan RM. The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*. 2003; 84: 822-848.
92. Neff KD. Development and validation of a scale to measure self-compassion. *Self and Identity*. 2003; 2: 223-250.
93. Feldman G, Hayes A, Kumar S, Greeson J, Laurenceau JP. Mindfulness and emotion regulation: the development and initial validation of the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R). *J Psychopathol Behav Asses*. 2007; 29: 177-190.
94. Gu J, Strauss C, Bond R, Cavanagh K. How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clin Psychol Rev*. 2015; 37: 1-12. doi: 10.1016/j.cpr.2015.01.006.
95. Labelle LE. How does mindfulness-based stress reduction (MBSR) improve psychological functioning in cancer patients? Doctoral thesis. University of Calgary, Calgary, Alberta, Canada. 2012.
96. Arch JJ, Mitchell JL. An Acceptance and Commitment Therapy (ACT) group intervention for cancer survivors experiencing anxiety at re-entry. *Psycho-oncology*. 2016; 25: 610-615. doi: 10.1002/pon.3890.
97. Montesinos F, Luciano C. Acceptance of Relapse Fears in Breast Cancer Patients: Effects of an ACT-Based Abridged Intervention. *Psicooncologia*. 2016; 13(1): 7-21.
98. Abad ANS, Bakhtiari M, Kashani FL, Habibi M. The Comparison of Effectiveness of Treatment Based on Acceptance and Commitment with Cognitive-Behavioral Therapy in Reduction of Stress and Anxiety in Cancer Patients. *International Journal of Cancer Research and Prevention*. 2016; 9(3)229-246.
99. Paez MB, Luciano C, Gutierrez YO. Tratamiento Psicologico para el afrontamiento del cancer de mama. Estudio comparativo entre estrategias de aceptacion y de control cognitivo. *Psicooncologia*. 2007; 4(1): 75-95.

100. Richardson A, Addington-Hall J, Amir Z, Foster C, Stark D, Armes J, et al. Knowledge, ignorance and priorities for research in key areas of cancer survivorship: findings from a scoping review. *British Journal of Cancer*. 2011; 105: S82-S94. doi: 10.1007/s00520-008-0444-y.
101. Foster C, Breckons M, Cotterell P, Barbosa L, Calman J, Corner D, et al. Cancer survivors' self-efficacy to self-manage in the year following primary treatment. *Journal of Cancer Survivorship*. 2015; 9(1): 11-19.
102. Hunter CM, Kessler CL, Kessler R (Eds). *Handbook of Clinical Psychology in Medical Settings. Evidence-Based Assessment and Intervention*. Springer Science + Business Media. New York. 2014.
103. Zernicke KA, Campbell TS, Specia M, McCabe-Ruff K, Flowers S, Tamawanga R, et al. The eCALM Trial: eTherapy for Cancer Applying Mindfulness. Exploratory Analyses of the Associations Between Online Mindfulness-Based Cancer Recovery Participation and Changes in Mood, Stress Symptoms, Mindfulness, Posttraumatic Growth, and Spirituality. *Minfulness*. 2016; 7: 1071-1081. doi: 10.1007/s12671-016-0141.
104. Karlsson P, Bergmark A. Compared with what? An analysis of control-group types in Cochrane and Campbell reviews of psychosocial treatment efficacy with substance use disorders. *Addiction*. 2015; 110(3): 420-8. doi: 10.1111/add.12799.
105. Field A. *Discovering Statistics Using IBM SPSS Statistics*. 4th Edition. Sage Publications. London. 2013.
106. Sanada K, Diez MA, Valero MS, Perez-Yus MC, Demarzo MMP, Montero-Marin J, et al. Effects of mindfulness-based interventions on biomarkers in healthy and cancer populations: a systematic review. *BMC Complementary and Alternative Medicine*. 2017; 17: 125. doi: 10.1186/s12906-017-1638-y.
107. National Institute for Clinical Excellence (NICE). *Improving supportive and palliative care for adults with cancer: Cancer service guideline [CSG4]*. March 2004.

108. The Scottish Government. A guide to delivering evidence based psychological therapies in Scotland: "The Matrix". 2015.
109. Li M, Kennedy EB, Byrne N, Gerin-Lajoie C, Green E, Katz MR, et al. The management of depression in patients with cancer. Toronto (ON): Cancer Care Ontario; 2015. Program in Evidence-based Care Guideline No.: 19-4.
110. Lehto RH, Wyatt G. Perceptions about using Mindfulness Therapy. *Cancer Nursing*. 2013; 36(4): E51-E60. doi: 10.1097/NCC.0b013e31826d2f16.
111. Eyles CG. Research project: MABcan Understanding and perceptions of mindfulness-based interventions and development of an adapted mindfulness intervention for breast cancer patients. University of Southampton. 2017.
https://www.southampton.ac.uk/medicine/academic_units/projects/mabcan.page. Accessed 5th June 2017.
112. Breen S, Schofi P, Aranda S, Development of nurse training programs for psychosocial interventions: Differences between the research and clinical environments. *Asia-Pac J Clin Oncol* 2012; 8(Suppl. 3): 116–217.
113. McHugh RK, Murray HW, Barlow DH. Balancing Fidelity and Adaptation in the Dissemination of Empirically-Supported Treatments: The Promise of Transdiagnostic Interventions. *Behav Res Ther*. 2009;47(11): 946-953.
114. Cancer Research UK <http://www.cancerresearchuk.org/health-professional/cancer-statistics/survival>. Accessed 1st June 2017.
115. Simonelli LE, Siegel SD, Duffy NM. Fear of cancer recurrence: a theoretical review and its relevance for clinical presentation and management. *Psycho-oncology*. 2016. doi: 10.1002/pon.
116. Turton P, Cooke H. Meeting the needs of people with cancer for support and self-management. *Contemporary Therapies in Nursing & Midwifery*. 2000; 6: 130-137.

117. Costanzo ES, Lutgendorf SK, Mattes ML, Trehan S, Robinson CB, Tewfik F, et al. Adjusting to life after treatment: distress and quality of life following treatment for breast cancer. *British Journal of Cancer*. 2007; 97: 1625-1631.
118. Stanton A L, Ganz PA, Rowland JH, Meyerowitz BE, Krupnick JL & Sears SR. Promoting Adjustment after Treatment for Cancer. *Cancer Supplement*. 2005; 104(11): 2609-2613.
119. Knobf MT. Clinical Update: Psychosocial Responses in Breast Cancer Survivors. *Seminars in Oncology Nursing*. 2011; 27(3): e1-e14.
120. Bennett JA, Cameron LD, Brown PM, Whitehead LC, Porter D, Ottaway-Parkes T, et al. Time Since Diagnosis as a Predictor of Symptoms, Depression, Cognition, Social Concerns, Perceived Benefits, and Overall Health in Cancer Survivors. *Oncology Nursing Forum*. 2010; 37(3).
121. Stanton AL. What Happens Now? Psychosocial Care for Cancer Survivors after Medical Treatment Completion. *Journal of Clinical Oncology*. 2012; 30(11): 1215-1220.
122. Institute of Medicine and National Research Council. *From Cancer Patient to Cancer Survivor: Lost in Transition*. Washington DC: The National Academies Press. 2005.
123. The Scottish Government. *Transforming Care After Treatment (TCAT)*. 2013. www.scotland.gov.uk/Topics/Health/Services/Cancer/TCAT. Accessed February 2014.
124. National Institute for Clinical Excellence (NICE). *Improving supportive and palliative care for adults with cancer: Cancer service guideline [CSG4]*. March 2004. <https://www.nice.org.uk/guidance/csg4>. Accessed 18th April 2017.
125. Baker F, Denniston M, Smith T & West MM. Adult Cancer Survivors: How are they faring? *Cancer (Suppl.)*. 2005;104(11): 2565-2576.
126. Lebel S, Ozakinci G, Humphris G, Mutsaers B, Thewes B, Prins J, et al. From normal response to clinical problem: definition and clinical features

- of fear of cancer recurrence. *Support Care Cancer*. 2016; 24: 3265-3268. doi: 10.1007/s00520-016-3272-5.
127. Crist JV & Grunfield EA. Factors reported to influence fear of recurrence in cancer patients: a systematic review. 2013. *Psycho-Oncology*; 22: 978-986.
 128. Humphris GM, Rogers S, McNally D, Lee-Jones C, Brown J & Vaughan D. Fear of recurrence and possible cases of anxiety and depression in orofacial cancer patients. *International Journal of Oral and Maxillofacial Surgery*. 2003; 32(5): 486-491.
 129. Koch L, Bertram H, Eberle A, Holleczeck B, Schmid-Hopfner S, Waldmann A, et al. Fear of recurrence in long-term breast cancer survivors—still an issue. Results on prevalence, determinants, and the association with quality of life and depression from the Cancer Survivorship—a multi-regional population based study. *Psycho-Oncology*. 2014; 23: 547-554.
 130. Skaali T, Fossa SD, Bremnes R, Dahl O, Haaland CF, Hauge ER, et al. Fear of recurrence in long-term testicular cancer survivors. *Psycho-Oncology*. 2009; 18: 580-588.
 131. Allen JD, Savadatti S, Levy AG. The transition from breast cancer 'patient' to 'survivor'. *Psycho-Oncology*. 2009; 18: 71-78.
 132. Forrester K. "Normal's different for me now": a qualitative study of women's experiences of ending treatment for breast cancer. Unpublished Doctoral Thesis, University of Edinburgh. 2008.
 133. Lauver DR, Connolly-Nelson K, Vang P. Stressors and Coping Strategies among Female Cancer Survivors after Treatments. *Cancer Nursing*. 2007; 30(2): 101-111.
 134. Simard S, Thewes B, Humphris G, Dixon M, Hayden C, Mireskandari S, et al. Fear of cancer recurrence in adult cancer survivors: a systematic review of quantitative studies. *J Cancer Surviv*. 2013; 7(3): 300-322. doi: 10.1007/s11764-013-0272-z.

135. Lee-Jones C, Humphris G, Dixon R, Hatcher MB. Fear of cancer recurrence—a literature review and proposed cognitive formulation to explain exacerbation of recurrence fears. *Psycho-Oncology*. 1997;6(2):95–105.
136. Butow P, Kelly S, Thewes B, Hruby G, Sharpe L, Beith J. Attentional bias and metacognitions in cancer survivors with high fear of cancer recurrence. *Psycho-Oncology*. 2015;24(4):416–423. DOI:10.1002/pon.3659.
137. Mishel MH. Uncertainty in Illness. *The Journal of Nursing Scholarship*. 1988;20(4):225–232.
138. Lepore SJ. A social-cognitive processing model of emotional adjustment to cancer. *Psychological Interventions for Cancer*. 2001; 6: 99–118. DOI:10.1037/10402-006.
139. Mellon S, Kershaw TS, Northouse LL, Freeman-Gibb L. A family-based model to predict fear of recurrence for cancer survivors and their caregivers. *Psycho-Oncology*. 2007;16(3):214–223.
140. Yalom ID. *Existential Psychotherapy*, Basic Books, Inc: New York, NY, 1980.
141. Simard S, Savard J, & Ivers H. Fear of cancer recurrence: specific profiles and nature of intrusive thoughts. *Journal of Cancer Survivorship*. 2010; 4, 361-371.
142. Myers SB, Manne SL, Kissane DW, Ozga M, Kashy DA, Rubin S, et al. Social-cognitive processes associated with fear of recurrence among women newly diagnosed with gynaecological cancers. *Gynaecologic Oncology*. 2013; 128: 120-127.
143. Thewes B, Butow P, Zachariae R, Christensen S, Simard S, & Gotay C. Fear of cancer recurrence: a systematic literature review of self-report measures. *Psycho-Oncology*. 2012; 21: 571-587.
144. Armes J, Crowe M, Colbourne L, Morgan H, Murrells T, Oakley C, et al. Patients' Supportive Care Needs Beyond the End of Cancer Treatment: A Prospective, Longitudinal Survey. *Journal of Clinical Oncology*. 2009; 27(36): 6172-6179.

145. Lobb EA, Joske D, Butow P, Kristjanson LJ, Cannell P, Cull G, et al. When the safety net of treatment has been removed: Patient's unmet needs at the completion of treatment for haematological malignancies. *Patient Education and Counseling*. 2009; 77: 103-108.
146. Dawson G, Madsen LT, Dains JE. Interventions to Manage Uncertainty and Fear of Recurrence in Female Breast Cancer Survivors: A Review of the Literature. *Clinical Journal of Oncology*. 2016; 20(6): E155-E161.
147. Hayes SC, Strosahl KD, Wilson KG. *Acceptance and commitment therapy: The process and practice of mindful change* (2nd edition). New York, NY: The Guilford Press. 2012.
148. Hayes SC, Luoma JB, Bond FW, Masuda A, Lillis J. Acceptance and Commitment Therapy: Model, processes and outcomes. *Behaviour Research and Therapy*. 2006; 44: 1-25.
149. Harris R. Embracing Your Demons: An Overview of Acceptance and Commitment Therapy. *Psychotherapy in Australia*. 2006; 12(4): 2-8.
150. Hayes SC, Strosahl KD, Bunting K, Twohig M, Wilson KG. What is acceptance and commitment therapy? In S. C. Hayes & K. D. Strosahl (Eds.), *A practical guide to acceptance and commitment therapy* (pp. 1-30). New York: Springer. 2004.
151. Scott W, McCracken LM, Trost Z. A psychological flexibility conceptualisation of the experience of injustice among individuals with chronic pain. *British Journal of Pain*. 2014; 8(2): 62-71.
152. Vowles KE, McCracken LM. Acceptance and values-based action in chronic pain: A study of treatment effectiveness and process. *Journal of Consulting and Clinical Psychology*. 2008; 76: 397-407.
153. Ferreira N. Investigating the role of psychological flexibility and the use of an acceptance and commitment therapy based intervention in irritable bowel syndrome. Unpublished Doctoral Thesis, University of Edinburgh. 2011.

154. Westin V, Hayes SC, Andersson G. Is it the sound or your relationship to it? The role of acceptance in predicting tinnitus impact. *Behaviour Research and Therapy*. 2008; 46(12): 1259-1265.
155. Garland EL, Thielking P, Thomas EA, Coombs M, White S, Lombardi J, et al. Linking dispositional mindfulness and positive psychological processes in cancer survivorship: a multivariate path analytic test of the mindfulness-to-meaning theory. *Psycho-oncology*. 2016. doi: 10.1002/pon.
156. Ciarrochi J, Fisher D, Lane L. The link between value motives, value success, and well-being among people diagnosed with cancer. *Psycho-Oncology*. 2011; 20: 1184-1192.
157. Gillanders DT, Sinclair AK, MacLean M, Jardine K. Illness cognitions, cognitive fusion, avoidance and self-compassion as predictors of distress and quality of life in a heterogeneous sample of adults, after cancer. *Journal of Contextual Behavioral Science*. 2015: 1–12. doi.org/10.1016/j.jcbs.2015.07.003.
158. Angiola JE, Bowen AM. Quality of Life in Advanced Cancer: An Acceptance and Commitment Therapy View. *The Counseling Psychologist*. 2013; 41: 313-335.
159. Feros D, Lane L, Ciarrochi J, Blackledge JT. Acceptance and Commitment Therapy (ACT) for improving the lives of cancer patients: a preliminary study. *Psycho-Oncology*. 2013; 22: 459-464.
160. Rost AD, Wilson K, Buchanan E, Hildebrandt MJ, Mutch D. Improving Psychological Adjustment among Late-Stage Ovarian Cancer Patients: Examining the Role of Avoidance in Treatment. *Cognitive and Behavioral Practice*. 2012; 19: 508-517.
161. Shumay D, Fujiye MT, Berman M, Gregg J, Melisko M, Dunn L. WiLLoW: An Acceptance and Commitment Therapy Intervention for Breast Cancer Survivors to address Anxiety, Worry and Fear of Cancer Recurrence. *Psycho-Oncology*. 2013; 22(Suppl.2): 26-27.
162. Hulbert-Williams N, Swash B, Storey L. Exploring the Acceptability of a Brief Acceptance and Commitment Therapy (ACT) Intervention for

- Cancer Survivors. *Psycho-Oncology*. 2014; 23 (Suppl. 3): 65–168. doi: 10.1111/j.1099-1611.2014.3694.
163. Thewes B, Brebach R, Dzidowska M, Rhodes P, Sharpe L, Butow P. Current approaches to managing fear of cancer recurrence; a descriptive survey of psychosocial and clinical health professionals. *Psycho-Oncology*. 2014; 23: 390-396.
164. Davies NJ, Batehup L. Towards a personalised approach to aftercare: a review of cancer follow-up in the UK. *J Cancer Surviv*. 2011; 5: 142-151. doi: 10.1007/s11764-010-0165-3.
165. Emery K. So You Want to Do an Online Study: Ethics Considerations and Lessons Learned. *Ethics & Behavior*. 2014; 24(4): 293-303.
166. Gosling SD, Vazire S, Srivastava S, John OP. Should We Trust Web-Based Studies? A Comparative Analysis of Six Preconceptions about Internet Questionnaires. *American Psychologist*. 2004; 99(2): 93-104.
167. Gillanders DT, Bolderston H, Bond FW, Dempster M, Flaxman PE, Campbell L, et al. The Development and Initial Validation of the Cognitive Fusion Questionnaire. *Behavior Therapy*. 2014; 45: 83-101.
168. Lebel S, Maheu C, Levebre M, Secord S, Courbasson C, Singh M, et al. Addressing fear of recurrence among women with cancer: a feasibility and preliminary outcome study. *J Cancer Surviv*. 2014; 8: 485-496. doi: 10.1007/s11764-014-0357-3.
169. Simard S, Savard J. Fear of Cancer Recurrence Inventory: development and initial validation of a multidimensional measure of fear of cancer recurrence. *Supportive Cancer Care*. 2009; 17: 241-251.
170. Costa DSJ. Screening for clinical levels of fear of cancer recurrence. *Psycho-oncology*. 2017: 1-2. doi: 10.1002/pon.4390.
171. Bond FW, Hayes SC, Baer RA, Carpenter KM, Guenole N, Orcutt HK, et al. Preliminary Psychometric Properties of the Acceptance and Action Questionnaire-II: A Revised Measure of Psychological Inflexibility and Experiential Avoidance. *Behavior Therapy*. 2011; 42: 676-688.

172. Gamez W, Chmielewski M, Kotov R, Ruggero C, Suzuki N, Watson D. The Brief Experiential Avoidance Questionnaire: Development and Initial Validation. *Psychological Assessment*. 2014; 26(1): 35-45.
173. Trompetter HR, ten Klooster PM, Schreurs KMG, Fledderus M, Westerhof GJ, Bohlmeijer ET. Measuring Values and Committed Action with the Engaged Living Scale (ELS): Psychometric Evaluation in a Nonclinical Sample and a Chronic Pain Sample. *Psychological Assessment*. 2013; 25(4): 1235-1246.
174. Brown KW, Ryan RM. The benefits of being present: Mindfulness and its role in psychological wellbeing. *Journal of Personality and Social Psychology*. 2003; 84 (4): 822-848.
175. Carlson LE, Brown KW. Validation of the Mindful Attention Awareness Scale in a cancer population. *Journal of Psychosomatic Research*. 2005; 58, 29-33.
176. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica*. 1983; 67(6): 361-370.
177. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The Validity of the Hospital Anxiety and Depression Scale. An Updated Literature Review. *Journal of Psychosomatic Research*. 2002; 52(2): 69-77.
178. Cella DF, Tulsky DS, Gray G, Sarafian B, Linn E, Bonomi A, et al. The Functional Assessment of Cancer Therapy scale: development and validation of the general measure. *Journal of Clinical Oncology*. 1993; 11(3): 570-579.
179. Webster K, Cella D, Yost K. The Functional Assessment of Chronic Illness Therapy (FACIT) Measurement System: properties, applications, and interpretation. *Health and Quality of Life Outcomes*. 2003; 1(79).
180. Faul F, Erdfelder E, Lang AG, Buchner A. G*POWER 3: A flexible statistical power analysis program for the social, behavioural and biomedical sciences. *Behaviour Research Methods*. 2007; 39(2): 175-191.

181. Little RJA. A Test of Missing Completely at Random for Multivariate Data with Missing Values. *Journal of the American Statistical Association*. 1988; 83(404): 1198-1202.
182. Enders CK. Analyzing Longitudinal Data with Missing Values. *Rehabilitation Psychology*. 2011; 56(4): 267-288.
183. Fox-Wasylyshyn SM, El-Masri MM. Focus on Research Methods: Handling Missing Data in Self-Report Measures. *Research in Nursing & Health*. 2005; 28: 488-495.
184. Hoaglin DC, Iglewicz B. Fine-Tuning Some Resistant Rules for Outlier Labelling. *Journal of the American Statistical Association*. 1987; 82(400): 1147-1149.
185. Field A. *Discovering Statistics Using IBM SPSS Statistics*. 4th Edition. Sage Publications. London. 2013.
186. Brucker PS, Yost K, Cashy J, Webster K, Cella D. General Population and Cancer Patient Norms for the Functional Assessment of Cancer Therapy – General (FACT-G). *Evaluation & the Health Professions*. 2005; 28(2): 192-211.
187. Holzner B, Kemmler G, Cella D, De Paoli C, Meraner V, Kopp M, et al. Normative data for functional assessment of cancer therapy General scale and its use for the interpretation of quality of life scores in cancer survivors. *Acta Oncologica*. 2004; 43(2): 153-160.
188. Mitchell AJ, Meader N, Symonds P. Diagnostic validity of the Hospital Anxiety and Depression Scale (HADS) in cancer and palliative settings: a meta-analysis. *J Affect Disord*. 2010; 126(3): 335-48. doi: 10.1016/j.jad.2010.01.067.
189. Breeman S, Cotton S, Fielding S, Jones GT. Normative data for the Hospital Anxiety and Depression Scale. *Qual Life Res*. 2015; 24(2): 391-8. doi: 10.1007/s11136-014-0763-z.
190. Osborne RH, Elsworth GR, Hopper JL. Age-specific norms and determinants of anxiety and depression in 731 women with breast cancer

- recruited through a population-based cancer registry. *European Journal of Cancer Care*. 2003; 39: 755-762.
191. Haynes SN, Lench HC. Incremental Validity of New Clinical Assessment Measures. *Psychological Assessment*. 2003; 15(4): 456-466.
192. Hayes AF. *Introduction to Mediation, Moderation and Conditional Process Analysis: A regression based approach*. New York: Guildford Press. 2013.
193. Hulbert-Williams NJ, Storey L. Psychological flexibility correlates with patient-reported outcomes independent of clinical or sociodemographic characteristics. *Support Care Cancer*. 2016; 24: 2513-2521. doi: 10.1007/s00520-015-3050-9.
194. Jensen CG, Elsass P, Neustrup P, Bihal T, Flyger H, Kay SM, et al. What to listen for in the consultation. Breast cancer patients' own focus on talking about acceptance-based psychological coping predicts decreased psychological distress and depression. *Patient Education and Counselling*. 2014; 97(2): 165-172. doi: 10.1016/j.pec.2014.07.020.
195. Simard S, Savard J, Ivers H. Fear of cancer recurrence: specific profiles and nature of intrusive thoughts. *J Cancer Surviv*. 2010; 4: 361-371. doi: 10.1007/s11764-010-0136-8.
196. Myers SB, Manne SL, Kissane DW, Ozga M, Kashy DA, Rubin S, et al. Social-cognitive processes associated with fear of recurrence among women newly diagnosed with gynaecological cancers. *Gynaecologic Oncology*. 2013; 128: 120-127.
197. Savard J, Ivers H. The evolution of fear of cancer recurrence during the cancer care trajectory and its relationship with cancer characteristics. *Journal of Psychosomatic Research*. 2013; 74: 354-360.
198. Taylor TR, Huntley ED, Sween J, Makambi K, Mellman TA, Williams CA, et al. An Exploratory Analysis of Fear of Recurrence among African-American Breast Cancer Survivors. *International Journal of Behavioral Medicine*. 2012; 19(3): 280-287.

199. Thewes B, Bell ML, Butow P, Beith J, Boyle F, Friedlander M, et al. Psychological morbidity and stress but not social factors influence level of fear of cancer recurrence in young women with early breast cancer: results of a cross-sectional study. 2013; 22(12): 2797-2806. doi: 10.1002/pon.3348.
200. Hulbert-Williams N, Pilkington M, Swash B, Storey L. Psychological transition after primary cancer treatment: Component mapping using Acceptance and Commitment Therapy for effective intervention development. *Psycho-oncology*. 2016; 25(S3):71.
201. Costa DSJ, Smith AB, Fardell JE. The sum of all fears: conceptual challenges with measuring fear of cancer recurrence. *Support Care Cancer*. 2016; 24: 1-3. doi: 10.1007/s00520-015-2943-y.
202. Walters SJ, Henriques-Cadby IBdA, Bortolami O, Flight L, Hind D, Jacques RM, et al. Recruitment and retention of participants in randomised controlled trials: a review of trials funded and published by the United Kingdom Health Technology Assessment Programme. *BMJ Open*. 2017; 7: e015276. doi: 10.1136/bmjopen-2016-015276.
203. MacMillan Cancer Support. Treatment Summary. A tool to improve communication between cancer services and primary care. http://www.macmillan.org.uk/documents/aboutus/health_professionals/recoverypackage/treatmentsummary.pdf. Accessed on 2nd June 2017.
204. Feurstein M. Defining cancer survivorship. *J Cancer Surviv*. 2007; 1: 5-7.
205. Lebel S, Ozakinci G, Humphris G, Thewes B, Prins B. Current state and future prospects of research on fear of cancer recurrence. *Psycho-oncology*. 2016. doi: 10.1002/pon.4103.
206. Ganz PA, Yip CH, Gralow JR, Distelhorst SR, Albain KS, Anderson BL, et al. Supportive care after curative treatment for breast cancer (survivorship care): Resource allocations in low-and middle-income countries. A Breast Health Global Initiative 2013 consensus statement. *The Breast*. 2013; 606-615.

207. Runowicz CD, Leach CR, Henry NL, Henry KS, Mackey HT, Cowens-Alvarado RL, et al. American Cancer Society/American Society of Clinical Oncology Breast Cancer Survivorship Care Guideline. *Journal of Clinical Oncology*. 2016; 34(6). doi:10.1200/JCO.2015.64.3809.
208. Mayer DK, Nasso SF, Earp JA. Defining cancer survivors, their needs, and perspectives on survivorship health care in the USA. *Cancer survivorship in the USA 1. Lancet Oncology*. 2017; 18: e11-e18.

Appendix 1. *PICO table used to guide question definition and study selection process*

	Inclusion	Exclusion
Population	<p>Humans, males & females</p> <p>Cancer survivors, defined as - individuals who have had a diagnosis of any type of cancer and have completed primary cancer treatment (e.g. surgery, chemotherapy, radiotherapy) (excluding ongoing hormonal therapies)</p> <p>Studies which recruit patients towards the end of treatment will be included if participants take part in the intervention following treatment completion</p> <p>Studies which include both post treatment survivors and those in current treatment will be included only if the results are reported separately.</p> <p>Individuals who were 18 years and older at the time of diagnosis, no upper age limit</p>	<p>Individuals newly diagnosed with cancer or currently undergoing primary cancer treatment.</p> <p>Individuals with metastatic (advanced/late stage) disease</p> <p>Individuals who have not received a cancer diagnosis.</p> <p>Adult survivors of paediatric cancer</p> <p>Family members of cancer patients (who may be referred to as cancer survivors based on some definitions)</p>

<p>Intervention</p>	<p>Mindfulness-based interventions.</p> <p>Interventions which have a central element of mindfulness, including Mindfulness-based Stress Reduction (MBSR); Mindfulness-based Cognitive Therapy (MBCT). Yoga studies only where clear component consistent with mindfulness practice.</p> <p>Interventions that target psychological wellbeing following cancer treatment e.g. aiming to reduce emotional distress and/or increase QOL or adaptive functioning (see FALLER 2013)</p> <p>Delivered by Psychologists or researchers; mental health clinicians or nursing staff with relevant training and experience.</p> <p>Delivered face to face, via the internet or other technology mediums</p> <p>Group and individual settings</p> <p>Self- help interventions, where participants access</p>	<p>Pharmacological interventions</p> <p>Interventions without an explicit mindfulness component e.g. yoga practice or physical exercise techniques</p> <p>Studies that are not directly testing a psychological intervention, rather a pathway/model of care for survivorship</p> <p>Interventions consisting purely of information giving, with no psychological element, e.g. Provision of an information booklet</p> <p>Interventions consisting purely of peer support, without an additional active psychological therapy element</p> <p>Self-help interventions with no active supportive intervention component delivered (e.g. booklet only), or where online intervention no synchronous therapist contact</p> <p>Psychological</p>
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	intervention materials and work through these in an interactive supported manner via the internet or other technology medium	interventions delivered to the partners/family members of cancer survivors, rather than the survivor themselves
Comparator	Studies including one or more comparison groups: Comparisons might include other non-active intervention control not including psychological intervention element (e.g. simple information giving), wait list control, or TAU	
Outcomes	<p>Any study which measures at least one of the following psychological outcomes:</p> <p>Distress (e.g. anxiety and/or depression)</p> <p>Fear of recurrence (measured using specific fear of recurrence measure)</p> <p>Positive psychological processes (e.g. post traumatic growth)</p> <p>Only studies which measured these outcomes using established validated questionnaires will be included</p> <p>Studies which collect outcome measures on at least two occasions, pre-</p>	<p>Studies which report only qualitative outcomes only</p> <p>Studies which collect outcome measures only at one time point</p>

	intervention and post	
Study Design	Only studies employing a Randomised Controlled Trial (RCT) design will be included	Non-randomised controlled trial, non-controlled / longitudinal pre-post designs, protocols of ongoing research, qualitative studies, commentaries, conference abstracts / posters, editorials, reviews of the literature, case studies/case series reviews

Appendix 2. Operationalisation of Quality Ratings

	RISK OF BIAS					
	Randomisation (selection bias)	Allocation concealment (selection bias)	Blinding (Detection bias)	Missing data (Attrition bias)	Data Handling (Attrition bias)	Selective reporting (reporting bias)
Well Addressed (+)	Participants were randomised to groups using a sequence generation process containing a random component e.g. coin tossing, random number table, shuffling envelopes.	Appropriate concealment method used e.g. central allocation, sealed envelopes	Where blinding of outcome assessors to allocated intervention was in place and unlikely to have been broken. OR where outcome measurements were conducted by individuals not involved in delivering the	Where attrition was <20% AND attrition rates were similar across groups	Intention to Treat (ITT) analysis was conducted.	Where a study protocol is available and all of the pre-specified primary and secondary outcomes (relevant to this review) have been reported. OR where a protocol is not available but it is clear that all pre-specified outcomes have been reported

			intervention.			
Poorly Addressed (-)	Participants were randomised to groups using a sequence generation process containing a non-random component, typically involving a systematic approach using e.g. date of birth, hospital number.	No adequate concealment method was used (e.g. open allocation or non-sealed envelopes)	Where no blinding of outcome assessors took place and outcomes were collected by individuals involved in the delivery of the intervention.	Where overall study attrition was >20%. OR Where attrition rates were not similar across groups	ITT analysis has not been carried out (e.g. per protocol / as treated analysis approach)	Where one or more of the pre-specified outcomes (relevant to this review) has not been reported, or have been reported using measurements or analysis that were not pre-specified. Or where one or more of the reported outcomes were not pre-specified, without good reason for their inclusion. Or where the study fails to report outcomes which would be expected for the type of study

Unable to Say (?)	Insufficient information reported to assess whether or not randomisation procedure was well or poorly addressed	Insufficient information reported to assess whether or not appropriately concealed allocation procedure was well or poorly assessed	Where study did not address blinding of outcome assessors OR there is insufficient information reported to establish who collected outcome measures	Where attrition rates were not reported.	Where it is not clear whether or not ITT analysis was carried out	Where there is insufficient information to establish whether or not reporting has been well or poorly addressed
	SAMPLE		INTERVENTION			
	Groups well defined and similar at baseline	Study Power	Therapist Training	Therapist Fidelity	Adherence Measures	OVERALL STUDY QUALITY
Well Addressed (+)	Where the main characteristics of the sample have	Where an a priori power calculation was carried out to	Where the intervention facilitator(s) have	Where there was an intervention protocol and	Where patient adherence (compliance) to	<u>High quality (++)</u> : Majority of

	<p>been described in sufficient detail to allow it to be established that the intervention and control groups are similar in characteristics at the start of the trial</p> <p>OR Any significant differences in baseline characteristics have been controlled for in the analysis as covariates.</p>	<p>determine sample size, taking into account assumed drop-out rate, and where the study was at least 0.80 powered OR where the power calculation did not take into account assumed drop out but was at least 0.80 powered with actual drop-out rate</p>	<p>relevant training and or experience in relation to the intervention being delivered. This may include a specified training course or evidence of prior experience delivering similar interventions</p>	<p>therapist fidelity to the protocol was formally measured using e.g. observational rating scale</p>	<p>intervention was formally measured using at least one method e.g. session attendance, homework log, diary of practice</p>	<p>criteria met (e.g. ≥ 9). Little or no risk of bias. Results unlikely to be changed by further research.</p>
Poorly Addressed (-)	<p>Where the main characteristics of the sample have been described in sufficient detail to allow it to be established that there are</p>	<p>Where no a prior power calculation was conducted to determine sample size. Or where an a priori sample size calculation was reported, but the</p>	<p>Where no training or experience relevant to the intervention being delivered has been provided to the intervention facilitator(s) or</p>	<p>Where there was no structured measure of therapist fidelity. Or where there was no pre-defined intervention</p>	<p>Where no formal adherence measure was utilised to assess participant adherence</p>	<p><u>Acceptable (+)</u>: Most criteria met (e.g. ≥ 7). Some flaws in the study with an associated</p>

	substantial differences in characteristics between the intervention and control groups at the start of the study, which have not been controlled for in the analysis.	study was <0.80 powered (with actual drop-out rate)	where training and/or experience described is not considered to be appropriate	protocol	(compliance) to the intervention	risk of bias. Conclusions may change in the light of further studies.
Unable to say (?)	Where there is insufficient information describing the characteristics of the sample to identify that both groups are similar at the start of the study	Where power was not addressed or there was insufficient information to determine if it was well or poorly addressed	Where there is insufficient information reported to establish if therapist training and/or supervision has been well or poorly established	Where there is insufficient information reported to establish if therapist fidelity was well or poorly addressed, or where intervention fidelity has not been addressed	Where there is insufficient information reported to establish if the adherence of participants was formally measured	<u>Low quality (0)</u> : Either most criteria not met (≤ 6), or significant flaws relating to key aspects of study design. Conclusions likely to change in

						the light of further studies
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Appendix 3. Quality Criteria Ratings of Reviewed Studies

	RISK OF BIAS					
	Randomisation procedure (Selection bias)	Allocation concealment (Selection bias)	Blinding of outcome assessors (Detection bias)	Amount & pattern of missing data (Attrition bias)	Handling of missing data (Attrition bias)	Selective outcome reporting (Reporting bias)
Blaes <i>et al.</i> (2016)	+	?	?	–	–	–
	Participants randomised using computer generated random number sequence	Not specified	Not specified	Overall attrition rate 21%. Missing data at post treatment FU not explained	ITT analysis not carried out	Self-compassion scale short form indicated as included in methods but results not reported. No explanation
Bower <i>et al.</i> (2016)	?	+	?	+	+	+
Boyle <i>et al.</i> (2017)	Not specified	Randomisation conditions kept in sealed envelope	Not specified	Moderate difference in attrition between Intervention (13%) Vs Control	Intention to treat analysis performed. Comparison of ITT results with	All pre-specified outcomes relevant to review reported

				group (6%). However overall attrition <20%.	list-wise deletion approach – similar findings	
Branstrom <i>et al.</i> (2010)	+	?	–	–	+	+
	Randomisation by computer generated randomisation sequence	Not specified	No blinding done	High overall attrition rate (29%). Attrition moderately different between groups: Intervention (36%) vs Control (24%)	ITT analysis performed using LOCF for missing data. Reported both ITT and per protocol, analysis	All pre-specified outcomes relevant to review reported
Carlson <i>et al.</i> (2013)	+	+	?	–	+	+
	Randomised by computer generated random number	Randomisation carried out by biostatistician	Blinding of RA collecting data at baseline reported, but unclear if blinded at post and FU data collection points	Large overall attrition rates (32%). Attrition not significantly different between groups $p=.755$ (MBCR 35%, SET 30%, Control 31%).	Reported both ITT and per protocol analysis	All pre-specified outcomes relevant to review reported

Hoffman <i>et al.</i> (2012)	+	+	+	-	+	+
	Randomised by computer generated randomisation program	Randomisation carried out by operations director: assumed independent of study	Blinding of data collection took place, RA collected data and was blinded and independent from delivery of intervention	Overall attrition rate <20%. Large difference in attrition between groups (MBSR 26% vs controls 3%)	ITT analysis reported	All pre-specified outcomes relevant to review reported
Lengacher <i>et al.</i> (2009)	+	?	?	+	+	+
	Randomisation by random number generator, stratified by stage of cancer and type of treatment received	Not specified	Data collectors blinded to allocation at baseline but no details on whether blinded at post intervention	Overall attrition level <20%. Equal and very low in both groups (2% vs 2%).	Intention to treat analysis reported	All pre-specified outcomes relevant to review reported
Lengacher <i>et al.</i> (2016)	+	?	?	+	+	+
	Randomised by computer generated program	Not specified	Not specified	Overall attrition <20%. Attrition rates similar across groups	Intention to treat analysis reported	All pre-specified outcomes relevant to review reported

				(9% MBSR vs 5% controls)		
Zernicke <i>et al.</i> (2014)	+	?	+	–	+	+
	Randomised on a cohort by cohort basis using computer generated random number sequence	Not specified	All outcome measures collected online – preventing recording bias from research team	Overall Attrition rates <20%. Attrition for intervention and Control group significantly different (17% vs 0%, $p=.016$)	Intention to treat analysis reported	All pre-specified outcomes relevant to review reported
Sarenmalm <i>et al.</i> (2017)	+	+	?	–	–	+
	Randomisation computerised, on a varying block size basis.	Assignment codes kept in sequentially numbered opaque sealed envelopes, prepared by the researcher	Not specified	Overall attrition <20%. Attrition levels similar across groups (MBSR 6%, active controls 9%, non-MBSR 4%)	Only analysed those with full datasets	All pre-specified outcome measures relevant to review reported
Crane-Okada <i>et al.</i> (2012)	+	?	?	–	?	+
	Randomisation by permuted randomised	Not specified	Not specified	Overall attrition 20.4%. Between group differences	Stated intention to treat but unclear? did not	All pre-specified outcome measures

	block design			in attrition 23% MM vs 16% controls	include all those randomised in analysis – not addressed	relevant to review reported
Dodds <i>et al.</i> (2015)	+	+	+	–	+	+
	Randomisation by stratified random block design using random block size	Allocation performed by study statistician: assumed independent from intervention	Outcome measures collected using online application – preventing bias in recording from research team	Overall attrition <20%. Large difference between attrition in Intervention (25%) vs Control (6%)	ITT analysis reported	All pre-specified outcome measures relevant to review reported
	Sample			Intervention		
	Intervention & control groups well defined and	Power calculation / study	Intervention delivered by trained therapist	Therapist fidelity	Participant adherence	Overall Study Quality Rating

	similar at baseline	adequately powered				
Blaes <i>et al.</i> (2016)	+	–	+	?	+	LOW
	No significant differences between groups at baseline for demographics or outcome measures	A priori power calculation, but didn't allow for assumed attrition. When taking into account actual attrition, study under powered (76%)	Delivered by 'faculty staff' with extensive training and certification in MBSR, plus MBSR training from expert	None reported	Group attendance reported, daily logs completed recording mean home practice time	
Bower <i>et al.</i> (2015)	+	+	+	?	+	ACCEPTABLE
Boyle <i>et al.</i> (2016)	Significant difference between groups at baseline in	A priori sample size calculation allowing for assumed	Expert with over 10 years' experience teaching MAPS	None reported	Group attendance reported, home practice time	

	relationship status; radiation received; smoking history; and depressive symptoms – however variables included as covariates in the analysis	attrition, study fully powered			recorded	
Branstrom <i>et al.</i> (2010)	+	–	–	?	+	
	No significant differences between groups at baseline in any demographic or outcome	A priori sample size calculation reported but didn't allow for assumed attrition. Study	Two clinical psychologists trained in CBT & personal experience mindfulness	None reported	Group attendance reported, home practice frequency recorded using 1	LOW

	variables	underpowered (75%) when actual attrition taken into account	practice. Only one had training in MBSR, neither had previous experience running MBSR group		question item	
Carlson <i>et al.</i> (2013)	+	+	+	?	?	
Schellekens <i>et al.</i> (2017)	No significant differences between groups on medical and demographic variables. Significant differences between sites for cancer stage;	A priori sample size calculation allowing for assumed attrition reported. Study 90% powered.	MBSR – ‘trained staff who had facilitated previous MBSR trials’, SET – therapists well trained in SET	None reported	Not reported, only limited information on proportion of sessions attended	ACCETPABLE

	marital status, and total years of education – site included as covariate in analysis					
Hoffman <i>et al.</i> (2012)	+	+	+	?	+	HIGH
	Groups similar on demographic characteristics. No significant difference between groups at baseline for any scale	A priori sample size calculation allowing for assumed attrition. Study fully powered	Delivered by qualified MBSR instructor, supervised by senior trainer, with previous experience of running MBSR with mix of cancer pts and staff under	None reported	Class attendance recorded. Time and amount of formal home mindfulness practice recorded using weekly record	

			supervision			
	?	+	+	+	+	
Lengacher <i>et al.</i> (2009)	Groups similar on demographics between Intervention and Control groups apart from race (18.6% vs 4.9% Black non- Hispanic). No details reported on baseline means for clinical or outcome measures to allow comparison	A priori sample size calculation but didn't allow for assumed attrition. However, study 91% powered taking into account actual attrition rate	'MBSR trained psychologist', no details of training or level of experience in MBSR	Independent observation of sessions for consistency (including timing of intervention activities, quality in qualitative report)	Compliance measured and established a priori at >75% attendance and >75% homework. Home practice recorded in diary.	ACCEPTABLE

	across groups at baseline.					
	Reported means adjusted for age; race; cancer stage; time since treatment completion					
Lengacher <i>et al.</i> (2016)	+	+	+	+	+	HIGH
	Use of anxiolytic medication significantly different between MBSR (30%) and Control (15%) at baseline $p=.03$ – included as covariate in	A priori sample size calculation allowing for assumed attrition. Study fully powered	Clinical Psychologist trained in MBSR	Structured observational method of evaluating therapist adherence to protocol.	Class attendance recorded and completion of diaries including home practice and number of monitored. Compliance set a priori at 75%	

	analysis				attendance and 75% homework.	
Zernicke <i>et al.</i> (2014)	+	+	+	?	+	ACCEPTABLE
	Independent samples t tests and X tests were performed to ensure group comparable at baseline, no significances reported	A priori sample size calculation but didn't allow for assumed attrition. However, study 98% powered taking into account actual attrition rate	Licensed clinician specialising in behavioural medicine, 15 years' experience teaching online MBSR. Trained in MBSR by authors	None reported	Online class attendance recorded and information on minutes practiced at home recorded each week.	
Sarenmalm <i>et al.</i> (2017)	+	+	+	?	?	LOW
	No significant differences on demographic or clinical	A priori sample size calculation but didn't allow for assumed	Led by certified MBSR instructors – nurses having undergone	None reported	Rates of class attendance not reported. Home practice reported	

characteristics between groups at baseline	attrition or report significance level. However, study fully powered taking into account actual attrition rate	extensive training, experience and examination	to have been measured in diaries, but not reported in results
--	---	---	---

Crane-Okada <i>et al.</i> (2012)	–	?	+	+	+	
Identified baseline differences between Intervention and Control groups in those who had received chemotherapy	Not specified		Instructor with experience and training in mindful movement techniques	Weekly debriefings to review process and outcome. RA monitored 50% sessions for fidelity using structured checklist and	Class attendance reported. Daily diaries completed to record home practice formal and informal mindfulness practice	LOW

	(52% vs. 21%) $p < 0.05$, and those retired (48% vs 79%) $p < 0.05$. Did not report use as covariates in analyses			recording of minutes of movement		
Dodds <i>et al.</i> (2015)	– Differences between groups at baseline on time since diagnosis; radiotherapy treatment received; and cancer prophylactic	+ A prior power calculation reported but did not consider attrition. However, study 93% powered with actual attrition rate	+ Clinically trained PhD social worker, 20 years' experience in meditation and CBCT teacher certification	+ Class content guided by manual. 50% sessions recorded and reviewed by CBCT training supervisor	+ Class attendance reported. Ptpts completed log of home practice (including number of sessions, minutes, use of audio and reflections)	HIGH

treatment. Did
not report
including these
treatment
variables as
covariates in
analyses

Appendix 4. Ethical Approval Letter

Lothian NHS Board

South East Scotland Research Ethics Committee 01



Waverley Gate
2-4 Waterloo Place
Edinburgh
EH1 3EG
Telephone 0131 536 9000

www.nhslothian.scot.nhs.uk

06 August 2015

Date 06 August 2015
Your Ref
Our Ref

Miss Kate Randell
Trainee Clinical Psychologist
NHS Forth Valley
Clinical Psychology Department
Old Nurses Home, Falkirk Community Hospital
Majors Loan, Falkirk
FK1 5QE

Enquiries to: Sandra Wyllie
Extension: 35473
Direct Line: 0131 465 5473
Email: Sandra.Wyllie@nhslothian.scot.nhs.uk

Dear Miss Randell,

Study title: Exploring the Impact of Psychological Flexibility on the Relationship between Fears of Cancer Recurrence and Adjustment in Cancer Survivors.

REC reference: 15/SS/0116

Protocol number: N/A

IRAS project ID: 165795

Thank you for your letter responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this favourable opinion letter. The expectation is that this information will be published for all studies that receive an ethical opinion but should you wish to provide a substitute contact point, wish to make a request to defer, or require further information, please contact the REC Manager, Dr Alex Bailey, sandra.wyllie@nhslothian.scot.nhs.uk. Under very limited circumstances (e.g. for student research which has received an unfavourable opinion), it may be possible to grant an exemption to the publication of the study.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at <http://www.rforum.nhs.uk>.



Headquarters
Waverley Gate, 2-4 Waterloo Place, Edinburgh EH1 3EG

Chair Mr Brian Houston
Chief Executive Tim Davison
Lothian NHS Board is the common name of Lothian Health Board

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity. For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation. Sponsors are not required to notify the Committee of approvals from host organisations

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database. This should be before the first participant is recruited but no later than 6 weeks after recruitment of the first participant.

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g. when submitting an amendment. We will audit the registration details as part of the annual progress reporting process. To ensure transparency in research, we strongly recommend that all research is registered but for non-clinical trials this is not currently mandatory. If a sponsor wishes to request a deferral for study registration within the required timeframe, they should contact hra.studyregistration@nhs.net. The expectation is that all clinical trials will be registered, however, in exceptional circumstances non registration may be permissible with prior agreement from NRES. Guidance on where to register is provided on the HRA website.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Ethical review of research sites

NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Non-NHS sites

The Committee has not yet completed any site-specific assessment (SSA) for the non-NHS research site(s) taking part in this study. The favourable opinion does not therefore apply to any non-NHS site at present. We will write to you again as soon as an SSA application(s) has been reviewed. In the meantime no study procedures should be initiated at non-NHS sites.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

<i>Document</i>	<i>Version</i>	<i>Date</i>
Copies of advertisement materials for research participants [Study Advert]	version1	16 June 2015
Covering letter on headed paper [Covering Letter]	N/A	22 June 2015
Covering letter on headed paper [Covering Letter]	N/A	03 August 2015
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only) [Certificate of Insurance]	N/A	22 June 2015
Other [Eligibility form]	version1	16 June 2015
Other [Study debrief sheet]	version1	16 June 2015
Other [Letter of support from Maggie's]	N/A	22 June 2015
Other [Employers Liability Insurance Certificate]	N/A	22 June 2015
Other [Indemnity Insurance confirmation]	N/A	22 June 2015
Other [Professional Indemnity confirmation]	N/A	22 June 2015
Participant information sheet (PIS) [Participant Information Sheet]	version1.1	14 July 2015
REC Application Form [REC_Form_22062015]		22 June 2015

Research protocol or project proposal [Research Protocol]	version1	16 June 2015
Summary CV for Chief Investigator (CI) [CV- Miss Kate Randell]	N/A	22 June 2015
Summary CV for supervisor (student research) [CV - Dr David Gillanders]	N/A	22 June 2015
Validated questionnaire [Study Questionnaire Pack]	version1	16 June 2015

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document "*After ethical review – guidance for researchers*" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The HRA website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

User Feedback

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website: <http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/>

HRA Training

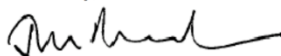
We are pleased to welcome researchers and R&D staff at our training days – see details at <http://www.hra.nhs.uk/hra-training/>

15/SS/0116

Please quote this number on all correspondence

With the Committee's best wishes for the success of this project.

Yours sincerely,



Dr Janet Andrews
Vice Chair

Email: sandra.wyllie@nhslothian.scot.nhs.uk

Enclosures: "After ethical review – guidance for researchers"

Copy to: Miss Elizabeth Craig, Mr Gavin Robertson

Appendix 5. *Patient Information Leaflet*



Participant Information Sheet

LIVING WELL AFTER CANCER TREATMENT

Please read the following information carefully before you decide whether or not to take part in this research study.

What is the purpose of the study?

Many cancer survivors who have completed cancer treatment experience fears about their cancer coming back, sometimes known as fears of recurrence. For some people, these fears can cause significant distress and negatively impact on their day to day wellbeing. However this is not the case for everyone and for some people, they have less of a negative impact.

The aim of this study is to investigate how psychological factors influence how cancer survivors are impacted by fears of recurrence. In particular, we are interested in the way that people deal with their feelings, thoughts and fears. It is hoped that findings from this study will help improve our understanding of fears of cancer recurrence, and develop interventions aimed at helping reduce their negative impact.

Who is carrying out this research?

This study is being carried out as part of a Clinical Psychology Doctorate thesis at the University of Edinburgh. It has been reviewed and approved by the University Of Edinburgh School of Health in Social Science Research Ethics Committee, and the South East Scotland Research Ethics Committee 01.

Who can take part in the study?

We are looking for individuals who fit the following criteria to take part in the study:

Aged 18 or over

Able to read in English

Have received a diagnosis of cancer

Have completed curative cancer treatment, including surgery; chemotherapy; radiotherapy; or any combination of these treatments, and have no evidence of any current cancer.

Note: (Breast and prostate cancer patients receiving ongoing hormonal and/or Herceptin treatments are eligible to take part)

In total, it is hoped that at least 145 people will participate in this study. Cancer survivors are being informed about the study and invited to take part via cancer support related services and relevant social media. The study is being supported by Maggie's Centres and online support centre.

Unfortunately, for insurance reasons we are not able to recruit participants to this study from the USA.

Do I have to take part?

It is up to you to decide whether or not to take part. The decision you make about taking part will not affect your attendance or use of Maggie's Centres in any way.

What does taking part involve?

It involves completing a set of 8 questionnaires, on one occasion. The questionnaires will ask you about your experience of fears about cancer recurrence; questions about how you think, feel and behave in your day to day life; and questions about distress and quality of life. The questionnaires can be completed online or, if you prefer, using pen and paper. If you choose this option you will be provided with a pre-addressed envelope to return the questionnaires.

By completing the study questionnaires online, or completing and returning them on paper, we will assume you consent to take part in the study. You can choose to exit the study at

any time, without giving a reason. However, as all the information collected will be non-identifiable, we will not be able to delete the answers you have already provided. Following your completion of the one-off questionnaire survey you will not be contacted again by the research team.

Will my taking part in the study be confidential?

Participation is completely anonymous. You will be asked to answer a few questions providing basic information about your cancer (such as the site of your cancer; time since your diagnosis; and type of treatment you received). This information is requested to check that you meet criteria for taking part in the study, and will not be used to identify you in any way.

What will happen to the information I provide?

If you choose to complete your questionnaires online, your answers will be collected using a survey tool, hosted by the University of Edinburgh, which will ensure your data is kept securely. Your survey answers will be downloaded and stored on a secure password protected computer. Your e-mail address will not be stored.

If you choose to complete your questionnaires on paper, paper questionnaires will be stored within a locked filing cabinet. These will be stored for a period of up to 5 years and then destroyed.

What are the possible benefits of taking part?

There is unlikely to be any immediate benefit to you in taking part in the study. However, you will be providing valuable information, which it is hoped will be used to develop new ways of helping cancer survivors to deal with fears of recurrence. In addition, sometimes people say that reflecting on their experience while completing the questionnaires can help them to make sense of it.

What are the possible risks and disadvantages of taking part?

It is possible that completing some of the questionnaires may bring up some unpleasant feelings or thoughts for you. If there are any questions which you would prefer not to answer, you may leave them blank, or choose the 'prefer not to answer' option if you are completing the questionnaires online.

If you would like to speak to someone for support on any issues arising from completing the questionnaires, there are a number of services that are available to provide support, which you will find details of when you exit the survey.

What will happen after the research is completed?

Once the study is complete, the data will be analysed and the findings will be presented for publication in a scientific journal and submitted for presentation at a national cancer research conference. A summary of findings from the study will also be published on the Maggie's online centre website. You will not be identifiable from the information included in the published findings.

If you have any further questions

If you would like to contact the lead researcher for further information, or if you have any queries, you can do so using the following contact details:

Kate Randell

Trainee Clinical Psychologist

University of Edinburgh

School of Health in Social Science

Teviot Place, Edinburgh

E-mail: k.randell@sms.ed.ac.uk

For general information about taking part in research, you can contact:

Dr Ethel Quayle

Director of Research and Knowledge Exchange – School of Health

22, Buccleuch Place, Edinburgh

To speak to someone who knows about this research study, but is not directly involved, you can contact:

Dr Emily Newman

University of Edinburgh

Department of Health in Social Sciences

Teviot Place, Edinburgh

If you wish to make a complaint about the study, please contact the University of Edinburgh's Research Governance team via email at: researchgovernance@ed.ac.uk

Thank you for taking the time to read this information.

Appendix 6. Author Guidelines – Journal of Cancer Survivorship

Journal of Cancer Survivorship

Research and Practice

Editor: Michael **Feuerstein**

ISSN: 1932-2259 (print version)

ISSN: 1932-2267 (electronic version)

Journal no. 11764



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Instructions for Authors

Types of Articles: Original Papers, Reviews, and Editorials.

EDITORIAL PROCEDURE

Single-blind peer review

This journal follows a single-blind reviewing procedure. Authors are therefore requested to submit a title page, containing title, all author names, affiliations, and the contact information of the corresponding author. Any acknowledgements, disclosures, or funding information should also be included on this page.

MANUSCRIPT SUBMISSION

Manuscript Submission

Submission of a manuscript implies: that the work described has not been published before; that it is not under consideration for publication anywhere else; that its publication has been approved by all co-authors, if any, as well as by the responsible authorities – tacitly or explicitly – at the institute where the

work has been carried out. The publisher will not be held legally responsible should there be any claims for compensation.

Permissions

Authors wishing to include figures, tables, or text passages that have already been published elsewhere are required to obtain permission from the copyright owner(s) for both the print and online format and to include evidence that such permission has been granted when submitting their papers. Any material received without such evidence will be assumed to originate from the authors.

Online Submission

Please follow the hyperlink "Submit online" on the right and upload all of your manuscript files following the instructions given on the screen.

TITLE PAGE

The title page should include:

- The name(s) of the author(s)
- A concise and informative title
- The affiliation(s) and address(es) of the author(s)
- The e-mail address, telephone and fax numbers of the corresponding author

Abstract

Please provide a structured abstract of 150 to 250 words which should be divided into the following sections:

- Purpose (stating the main purposes and research question)
- Methods
- Results
- Conclusions
- Implications for Cancer Survivors

Keywords

Please provide 4 to 6 keywords which can be used for indexing purposes.

Manuscripts are typically 15-20 double-spaced typed pages. Table and figures should be limited to 3-4 total. If you think your article will be significantly shorter or longer than that average, please include an explanation along with your submission.

TEXT

Text Formatting

Manuscripts should be submitted in Word.

Use a normal, plain font (e.g., 10-point Times Roman) for text.

Use italics for emphasis.

Use the automatic page numbering function to number the pages.

Do not use field functions.

Use tab stops or other commands for indents, not the space bar.

Use the table function, not spreadsheets, to make tables.

Use the equation editor or MathType for equations.

Save your file in docx format (Word 2007 or higher) or doc format (older Word versions).

Manuscripts with mathematical content can also be submitted in LaTeX.

[LaTeX macro package \(zip, 182 kB\)](#)

Headings

Please use no more than three levels of displayed headings.

Abbreviations

Abbreviations should be defined at first mention and used consistently thereafter.

Footnotes

Footnotes can be used to give additional information, which may include the citation of a reference included in the reference list. They should not consist solely of a reference citation, and they should never include the bibliographic details of a reference. They should also not contain any figures or tables.

Footnotes to the text are numbered consecutively; those to tables should be indicated by superscript lower-case letters (or asterisks for significance values and other statistical data). Footnotes to the title or the authors of the article are not given reference symbols.

Always use footnotes instead of endnotes.

Acknowledgments

Acknowledgments of people, grants, funds, etc. should be placed in a separate section on the title page. The names of funding organizations should be written in full.

SCIENTIFIC STYLE

Please always use internationally accepted signs and symbols for units (SI units).

Please use the standard mathematical notation for formulae, symbols etc.:

Italic for single letters that denote mathematical constants, variables, and unknown quantities

Roman/upright for numerals, operators, and punctuation, and commonly defined functions or abbreviations, e.g., cos, det, e or exp, lim, log, max, min, sin, tan, d (for derivative)

Bold for vectors, tensors, and matrices.

REFERENCES

Citation

Reference citations in the text should be identified by numbers in square brackets. Some examples:

1. Negotiation research spans many disciplines [3].
2. This result was later contradicted by Becker and Seligman [5].
3. This effect has been widely studied [1-3, 7].

Reference list

The list of references should only include works that are cited in the text and that have been published or accepted for publication. Personal communications and unpublished works should only be mentioned in the text. Do not use footnotes or endnotes as a substitute for a reference list.

The entries in the list should be numbered consecutively.

Journal article

Smith JJ. The world of science. *Am J Sci.* 1999;36:234–5.

Article by DOI

Slifka MK, Whitton JL. Clinical implications of dysregulated cytokine production. *J Mol Med.* 2000; doi:10.1007/s001090000086

Book

Blenkinsopp A, Paxton P. Symptoms in the pharmacy: a guide to the management of common illness. 3rd ed. Oxford: Blackwell Science; 1998.

Book chapter

Wyllie AH, Kerr JFR, Currie AR. Cell death: the significance of apoptosis. In: Bourne GH, Danielli JF, Jeon KW, editors. *International review of cytology*. London: Academic; 1980. pp. 251–306.

Online document

Doe J. Title of subordinate document. In: *The dictionary of substances and their effects*. Royal Society of Chemistry. 1999. [http://www.rsc.org/dose/title of subordinate document](http://www.rsc.org/dose/title%20of%20subordinate%20document). Accessed 15 Jan 1999.

Always use the standard abbreviation of a journal's name according to the ISSN List of Title Word Abbreviations, see

[ISSN.org LTWA](http://ISSN.org/LTWA)

If you are unsure, please use the full journal title.

For authors using EndNote, Springer provides an output style that supports the formatting of in-text citations and reference list.

[EndNote style \(zip, 3 kB\)](#)

TABLES

All tables are to be numbered using Arabic numerals.

Tables should always be cited in text in consecutive numerical order.

For each table, please supply a table caption (title) explaining the components of the table.

Identify any previously published material by giving the original source in the form of a reference at the end of the table caption.

Footnotes to tables should be indicated by superscript lower-case letters (or asterisks for significance values and other statistical data) and included beneath the table body.

ELECTRONIC SUPPLEMENTARY MATERIAL

Springer accepts electronic multimedia files (animations, movies, audio, etc.) and other supplementary files to be published online along with an article or a book chapter. This feature can add dimension to the author's article, as certain information cannot be printed or is more convenient in electronic form.

Before submitting research datasets as electronic supplementary material, authors should read the journal's Research data policy. We encourage research data to be archived in data repositories wherever possible.

Submission

Supply all supplementary material in standard file formats.

Please include in each file the following information: article title, journal name, author names; affiliation and e-mail address of the corresponding author.

To accommodate user downloads, please keep in mind that larger-sized files may require very long download times and that some users may experience other problems during downloading.

Audio, Video, and Animations

Aspect ratio: 16:9 or 4:3

Maximum file size: 25 GB

Minimum video duration: 1 sec

Supported file formats: avi, wmv, mp4, mov, m2p, mp2, mpg, mpeg, flv, mxp, mts, m4v, 3gp

Text and Presentations

Submit your material in PDF format; .doc or .ppt files are not suitable for long-term viability.

A collection of figures may also be combined in a PDF file.

Spreadsheets

Spreadsheets should be submitted as .csv or .xlsx files (MS Excel).

Specialized Formats

Specialized format such as .pdb (chemical), .vrl (VRML), .nb (Mathematica notebook), and .tex can also be supplied.

Collecting Multiple Files

It is possible to collect multiple files in a .zip or .gz file.

Numbering

If supplying any supplementary material, the text must make specific mention of the material as a citation, similar to that of figures and tables.

Refer to the supplementary files as "Online Resource", e.g., "... as shown in the animation (Online Resource 3)", "... additional data are given in Online Resource 4".

Name the files consecutively, e.g. "ESM_3.mpg", "ESM_4.pdf".

Captions

For each supplementary material, please supply a concise caption describing the content of the file.

Processing of supplementary files

Electronic supplementary material will be published as received from the author without any conversion, editing, or reformatting.

Accessibility

In order to give people of all abilities and disabilities access to the content of your supplementary files, please make sure that

The manuscript contains a descriptive caption for each supplementary material

Video files do not contain anything that flashes more than three times per second (so that users prone to seizures caused by such effects are not put at risk)

ETHICAL RESPONSIBILITIES OF AUTHORS

This journal is committed to upholding the integrity of the scientific record. As a member of the Committee on Publication Ethics (COPE) the journal will follow the COPE guidelines on how to deal with potential acts of misconduct.

Authors should refrain from misrepresenting research results which could damage the trust in the journal, the professionalism of scientific authorship, and ultimately the entire scientific endeavour. Maintaining integrity of the research and its presentation can be achieved by following the rules of good scientific practice, which include:

The manuscript has not been submitted to more than one journal for simultaneous consideration.

The manuscript has not been published previously (partly or in full), unless the new work concerns an expansion of previous work (please provide transparency on the re-use of material to avoid the hint of text-recycling ("self-plagiarism")).

A single study is not split up into several parts to increase the quantity of submissions and submitted to various journals or to one journal over time (e.g. "salami-publishing").

No data have been fabricated or manipulated (including images) to support your conclusions

No data, text, or theories by others are presented as if they were the author's own ("plagiarism"). Proper acknowledgements to other works must be given (this includes material that is closely copied (near verbatim), summarized and/or paraphrased), quotation marks are used for verbatim copying of material, and permissions are secured for material that is copyrighted.

Important note: the journal may use software to screen for plagiarism.

Consent to submit has been received explicitly from all co-authors, as well as from the responsible authorities - tacitly or explicitly - at the institute/organization where the work has been carried out, **before** the work is submitted.

Authors whose names appear on the submission have contributed sufficiently to the scientific work and therefore share collective responsibility and accountability for the results.

Authors are strongly advised to ensure the correct author group, corresponding author, and order of authors at submission. Changes of authorship or in the order of authors are **not** accepted **after** acceptance of a manuscript.

Adding and/or deleting authors **at revision stage** may be justifiably warranted. A letter must accompany the revised manuscript to explain the role of the added and/or deleted author(s). Further documentation may be required to support your request.

Requests for addition or removal of authors as a result of authorship disputes after acceptance are honored after formal notification by the institute or independent body and/or when there is agreement between all authors.

Upon request authors should be prepared to send relevant documentation or data in order to verify the validity of the results. This could be in the form of raw data, samples, records, etc. Sensitive information in the form of confidential proprietary data is excluded.

If there is a suspicion of misconduct, the journal will carry out an investigation following the COPE guidelines. If, after investigation, the allegation seems to raise valid concerns, the accused author will be contacted and given an opportunity to address the issue. If misconduct has been established beyond reasonable doubt, this may result in the Editor-in-Chief's implementation of the following measures, including, but not limited to:

If the article is still under consideration, it may be rejected and returned to the author.

If the article has already been published online, depending on the nature and severity of the infraction, either an erratum will be placed with the article or in severe cases complete retraction of the article will occur. The reason must be given in the published erratum or retraction note. Please note that retraction means that the paper is **maintained on the platform**, watermarked "retracted" and explanation for the retraction is provided in a note linked to the watermarked article.

The author's institution may be informed.

COMPLIANCE WITH ETHICAL STANDARDS

To ensure objectivity and transparency in research and to ensure that accepted principles of ethical and professional conduct have been followed, authors should include information regarding sources of funding, potential conflicts of interest (financial or non-financial), informed consent if the research involved human participants, and a statement on welfare of animals if the research involved animals.

Authors should include the following statements (if applicable) in a separate section entitled "Compliance with Ethical Standards" when submitting a paper:

Disclosure of potential conflicts of interest

Research involving Human Participants and/or Animals

Informed consent

Please note that standards could vary slightly per journal dependent on their peer review policies (i.e. single or double blind peer review) as well as per journal subject discipline. Before submitting your article check the instructions following this section carefully.

The corresponding author should be prepared to collect documentation of compliance with ethical standards and send if requested during peer review or after publication.

The Editors reserve the right to reject manuscripts that do not comply with the above-mentioned guidelines. The author will be held responsible for false statements or failure to fulfill the above-mentioned guidelines.

DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST

Authors must disclose all relationships or interests that could have direct or potential influence or impart bias on the work. Although an author may not feel there is any conflict, disclosure of relationships and interests provides a more complete and transparent process, leading to an accurate and objective assessment of the work. Awareness of a real or perceived conflicts of interest is a perspective to which the readers are entitled. This is not meant to imply that a financial relationship with an organization that sponsored the research or compensation received for consultancy work is inappropriate. Examples of potential conflicts of interests **that are directly or indirectly related to the research** may include but are not limited to the following:

Research grants from funding agencies (please give the research funder and the grant number)

Honoraria for speaking at symposia

Financial support for attending symposia

Financial support for educational programs

Employment or consultation

Support from a project sponsor

Position on advisory board or board of directors or other type of management relationships

Multiple affiliations

Financial relationships, for example equity ownership or investment interest

Intellectual property rights (e.g. patents, copyrights and royalties from such rights)

Holdings of spouse and/or children that may have financial interest in the work

In addition, interests that go beyond financial interests and compensation (non-financial interests) that may be important to readers should be disclosed. These may include but are not limited to personal relationships or competing interests directly or indirectly tied to this research, or professional interests or personal beliefs that may influence your research.

The corresponding author collects the conflict of interest disclosure forms from all authors. In author collaborations where formal agreements for representation allow it, it is sufficient for the corresponding author to sign the disclosure form on behalf of all authors. Examples of forms can be found

[here](#):

The corresponding author will include a summary statement in the text of the manuscript in a separate section before the reference list, that reflects what is recorded in the potential conflict of interest disclosure form(s).

See below examples of disclosures:

Funding: This study was funded by X (grant number X).

Conflict of Interest: Author A has received research grants from Company A. Author B has received a speaker honorarium from Company X and owns stock in Company Y. Author C is a member of committee Z.

If no conflict exists, the authors should state:

Conflict of Interest: The authors declare that they have no conflict of interest.

RESEARCH INVOLVING HUMAN PARTICIPANTS AND/OR ANIMALS

1) Statement of human rights

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